Metals Review
THE NEWS DIGEST MAGAZINE

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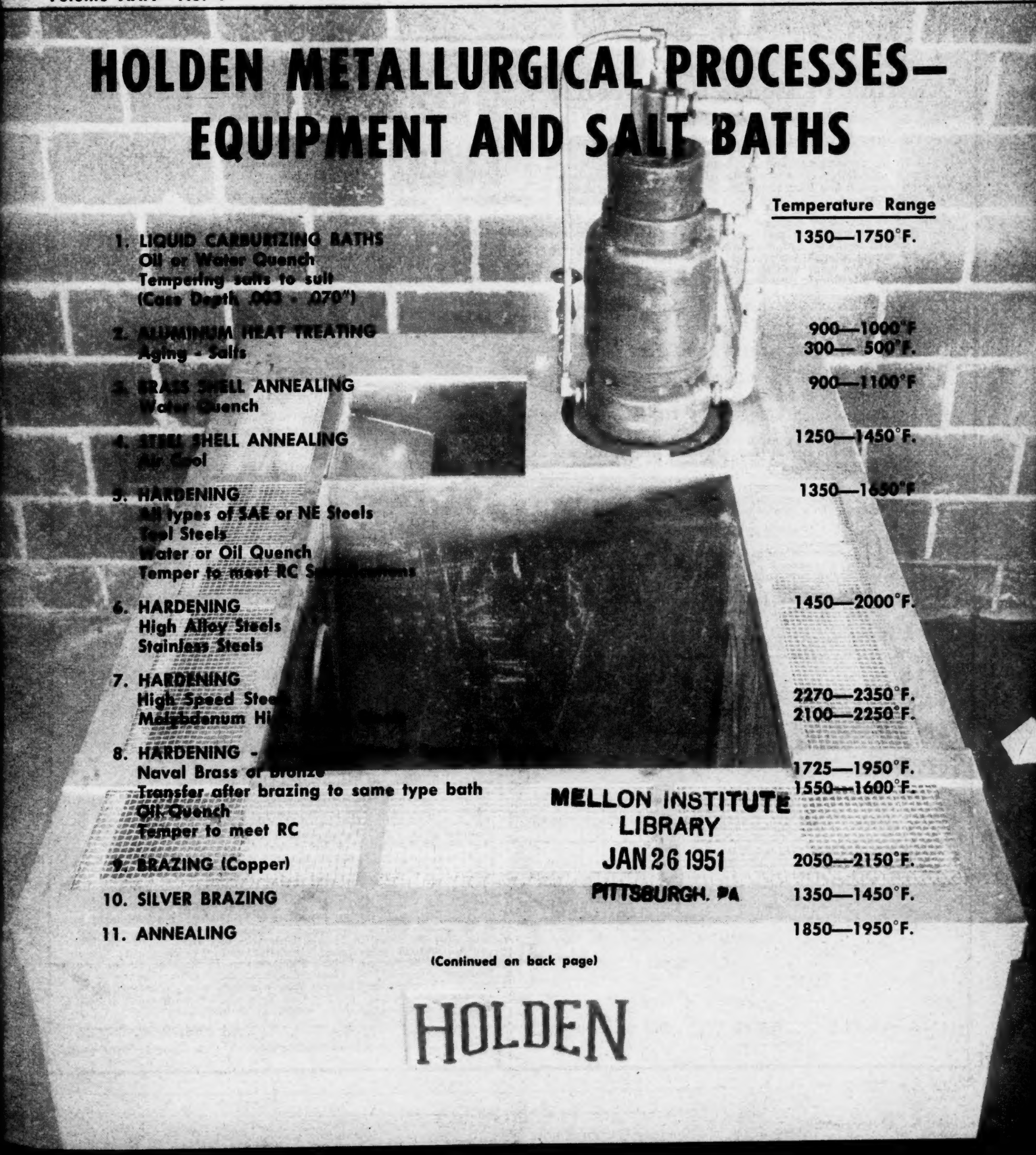

HOLDEN METALLURGICAL PROCESSES— EQUIPMENT AND SALT BATHS

	Temperature Range
1. LIQUID CARBURIZING BATHS Oil or Water Quench Tempering salts to suit (Case Depth .003 - .070")	1350—1750°F.
2. ALUMINUM HEAT TREATING Aging - Salts	900—1000°F 300— 500°F.
3. BRASS SHELL ANNEALING Water Quench	900—1100°F
4. STEEL SHELL ANNEALING Air Cool	1250—1450°F.
5. HARDENING All types of SAE or NE Steels Tool Steels Water or Oil Quench Temper to meet RC Specifications	1350—1650°F
6. HARDENING High Alloy Steels Stainless Steels	1450—2000°F.
7. HARDENING High Speed Stee[illegible] Molybdenum Hi[illegible]	2270—2350°F. 2100—2250°F.
8. HARDENING - [illegible] Naval Brass or Bronze Transfer after brazing to same type bath Oil Quench Temper to meet RC	1725—1950°F. 1550—1600°F.
9. BRAZING (Copper)	2050—2150°F.
10. SILVER BRAZING	1350—1450°F.
11. ANNEALING	1850—1950°F.

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Metals Review

THE NEWS DIGEST MAGAZINE

VOLUME XXIV, No. 1 **JANUARY, 1951**

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DEPARTMENTS

ASM REVIEW OF METAL LITERATURE

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for sales and metals information!

The American Society for Metals in co-operation with the western branches of 20 other National Technical Societies, is again sponsoring the exceptionally timely and dynamic Western Metal Congress & Exposition.

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Technical Sessions at Western Metal Show Will Feature Engineering Problems

Technical sessions of the American Society for Metals at the Seventh Western Metal Congress and Exposition, March 19 to 23, 1951, in the Auditorium and Exposition Hall, Oakland, Calif., are being set up along lines to interest and assist the mechanical and other engineers of the West. The A.S.M. technical program, which will be but one of several sponsored by various technical societies cooperating in the Congress, is being worked out by a committee headed by Earl R. Parker of University of California.

Each A.S.M. session will be devoted to an industry, such as aircraft, oil, large machinery, small equipment, and shipbuilding. Other societies' programs in addition will be devoted to mining, chemical, manufacturing and other industries.

First paper on each A.S.M. session will be by a top-bracket mechanical engineer, who will give the over-all view of an engineering problem. Second paper will be by a materials engineer, who will discuss properties and applications of existing commercial alloys. Third and fourth papers will be by nationally known authorities familiar with the industry or materials under consideration. Ample time will be allowed for discussion.

A "Seminar of Mechanical Failures" is planned for Wednesday morning, March 21. Subjects for discussion will include high-temperature and low-temperature failures, fatigue failures, and weld failures. Speakers will include Walter E. Jominy, staff engineer for Chrysler Corp. and A.S.M. national president; J. H. Hollomon of General Electric Co.; A. E. Focke, Diamond Chain Co., immediate past president of A.S.M.; D. S. Clark, California Institute of Technology; and J. B. Dotson, Nordstrom Valve Co.

Another seminar set for Wednesday afternoon will be devoted to failures resulting from general corrosion, stress-corrosion, corrosion fatigue, and corrosion problems in the aircraft and oil industries. Speakers on the corrosion seminar include Hollomon; J. B. Austin of U. S. Steel Research Laboratories; Frank W. Dearborn, Boeing Aircraft Co.; Edgar C. Bain, U. S. Steel Corp.; Herbert J. French, International Nickel Co.; and Clyde Williams, Battelle Memorial Institute.

On a program devoted to recent developments in materials and methods for aircraft propulsion units will be heard papers on "Design Limitations and Selection of Materials for Jet Engines", "Development of Superior Alloys for Gas Turbines", "Problems of Rocket Design", and "Use of Metallic Materials for Rocket Construction".

A session devoted to materials and methods for airframe manufacture will include "Modern Trends in Aircraft Structural Design", both in this country and in England, "Metal Fabrication Processes" and "Joining and Assembly Techniques".

Theme of both the Western Metal Congress and the Exposition is "Production for America". Approximately 200 nationally known firms will have their new developments and products on display.

AEC Fellowships Available

The U. S. Atomic Energy Commission has selected the Oak Ridge Institute of Nuclear Studies, Inc., of Oak Ridge, Tenn., as nation-wide administrator of the AEC predoctoral and postdoctoral fellowship programs for the 1951-52 academic year. The tentative number of fellowships includes up to 150 predoctoral fellowships and up to 30 postdoctoral fellowships in the physical sciences.

Applications must be received by Feb. 15, 1951. Application forms and information may be obtained from Oak Ridge Institute of Nuclear Studies, University Relations Division, P.O. Box 117, Oak Ridge, Tenn.

Receives 25-Year Certificate

Prof. Clark B. Carpenter (Center), Immediate Past Chairman of the Rocky Mountain Chapter A. S. M. and Head of the Department of Metallurgy, Colorado School of Mines, Receives the 25-Year A.S.M. Membership Certificate From James Colasanti, Present Chairman. George E. Lundberg (right), vice-chairman, looks on approvingly. Professor Carpenter was also presented the past chairman's certificate at this meeting. (Reported by P. Grimard, General Iron Works Co.)

Tells How Metallurgist Aids Chemical Industry

Reported by Howard E. Boyer
Chief Metallurgist
American Bosch Corp.

The regular meeting of the Springfield Chapter A.S.M. on Nov. 20 was held jointly with the Springfield Section of the American Electroplaters Society. The technical talk on "Metallurgy and the Chemical Industry" was presented by James A. Collins, materials engineer for E. I. du Pont de Nemours & Co.

Dr. Collins' discussion centered on the services rendered by the metallurgist to the chemical industry in selecting constructional materials, in fabricating, and in maintaining safe, corrosion resistant process equipment. His illustrations showed the relative resistance of the austenitic stainless steels to sensitization, and the importance of low carbon to resist sensitization which occurs on short-time exposure in the range 800 to 1400° F.

Dr. Collins stated that Type ELC 304 (0.03% C max.) stainless steel in general is a satisfactory substitute for Type 347 stainless in many chemical corrosive services. Type 321 stainless steel (titanium) for many chemical applications may be the equivalent of Type 347, but Type 321 is inferior to Type 347 in severe nitric acid service. (For an extended discussion of this problem, see *Metal Progress* for November 1950, Page 691.)

Des Moines Christmas Party

Reported by L. F. Janssen
John Deere Des Moines Works

The annual Christmas Party for the Des Moines Chapter A.S.M. was held in conjunction with the regular December meeting. All members and guests present thoroughly enjoyed a chicken dinner and the professional entertainment which followed.

Tempering Process May Be Divided Into Four Stages

Reported by F. J. Welchner
Metallurgist
Canton Drop Forging & Mfg. Co.

Tempering, according to Morris Cohen, in his talk at the Nov. 6th meeting of the Canton-Massillon Chapter A.S.M., may be defined as reheating of hardened steel below the critical temperature. Much attention has been focused to date on the hardening and hardenability characteristics of steel and comparatively little on its tempering. The science of tempering should be studied more thoroughly to correct some of the faults inherent in normal hardening and to obtain the best combination of physical properties from the steel, the speaker recommended. Dr. Cohen is professor of physical metallurgy at Massachusetts Institute of Technology.

The tempering process may be divided into four stages as the tempering temperature is raised. The first stage results in martensite decomposition—that is, primary precipitation and, in high-carbon steels, some increase in hardness. The second stage results in decomposition of the austenite retained from the quench and causes expansion. Evidence of the occurrence of the first and second stages of tempering was shown by dilatometric and metallographic studies.

Precipitation of cementite is a product of the third stage of tempering. This is the last stage for carbon steels. For steels containing alloys that form more stable carbides than cementite, precipitation of this alloy carbide takes place in the fourth stage.

The effect of refrigeration after quenching is to promote further transformation of the retained austenite normally present in steels such as high speed toolsteel. The decrease in retained austenite after quenching, refrigerating and tempering results in a marked increase in elastic limit with no appreciable change in ultimate strength.

The elastic limit in this investigation was determined on special test bars, spherically ground on each end. Over-all dimensional changes were accurately measured to within a few micro-inches per inch after release of increasing increments of stress application. The purpose of this procedure was to approach an absolute figure for elastic limit.

Dr. Cohen pointed out that the refrigerating operation, most effective immediately after quenching to room temperature, should be used with caution because of the possibility of cracking. Section sizes, shape of part and cost of the refrigerating operation must be taken into account in actual practice.

The benefit obtained from double tempering of steels of the high speed type, in order to temper the martensite transformed from the retained austenite in the first tempering treatment, was discussed.

Embrittlement occurs in some steels when tempered at about 500° F. Retained austenite has been blamed for this phenomenon, which is not evident in a tensile test at room temperature but becomes quite pronounced at subzero temperature or in a notched-bar test. Investigation showed that steel which was refrigerated after quenching—thereby eliminating or minimizing the percentage of retained austenite—and then tempered at 500° F., exhibited more pronounced embrittlement in the bend test than steels which had not been subjected to the refrigerating treatment. The investigation indicated, therefore, that retained austenite is not the cause of embrittlement in this tempering range.

Sustaining Members Have Displays at North Texas

Reported by Arthur C. Willis
School of Engineering
Southern Methodist University

North Texas Chapter held its second annual Sustaining Members' Night at the Blackstone Hotel, Fort Worth, on Nov. 8, with exactly 100 in attendance. A social hour preceding the dinner provided ample opportunity to examine the displays prepared by the sustaining members.

Speaker of the evening was Lt.-Col. George W. Dorn, Commanding Officer of the Dallas Chemical Procurement District, who discussed briefly the procurement methods used by the armed services.

A feature of the meeting was the distribution of glass ashtrays bearing the Society's name and monogram and the chapter's name.

Zapffe Explains New Theory

Reported by J. P. Simpson
Chief Chemist
Canadian Car & Foundry Co.

"A New Theory for the Solid State" was presented by Carl A. Zapffe, consulting metallurgist of Baltimore, Md., before the November meeting of the Montreal Chapter A.S.M. Known as the "micellar theory", it is explained briefly and its background and development traced, in the report of the Ottawa Valley Chapter on page 9.

Technical chairman was John P. Ogilvie of McGill University, who did an excellent job of presenting the many questions and discussions that Dr. Zapffe's talk evoked.

The movie "Metal Crystals" was presented as a preliminary event, and provided an excellent forerunner for the evening's talk.

Philadelphia Inaugurates Students' Night Lecture; Mehl to Receive Citation

Reported by George L. Schiel
Chief Metallurgist, Metlab Co.

Appreciation will be shown to leaders in the field of metallurgical education by the Philadelphia Chapter, which has taken the lead in establishing a citation for "Notable Contributions to Metallurgical Education".

R. F. Mehl

In establishing the "Students' Night Lecture" the chapter will extend to all students of metals in the Philadelphia area the opportunity to hear Robert F. Mehl, head of the department of metallurgy, Carnegie Institute of Technology, deliver the first annual lecture next spring and receive the new citation. At this meeting the chapter looks forward to continuing its policy of actively promoting metallurgical education in the Philadelphia area through closer collaboration with students and their educational institutions.

Dr. Mehl's record in research and education more than justifies his selection as the initial recipient of the new citation. Dr. Mehl received his formal education at Franklin and Marshall College and Princeton University, where he obtained the degrees of B.S. (1919) and Ph.D. (1924). For the next 11 years he held in rapid succession many important fellowships and directorships of departments in chemistry and metallurgy. In 1935 he was appointed to his present position as head of the department at Carnegie Tech. His work has brought him many honorary degrees, medals and awards, both here and abroad.

Dr. Mehl's subject for this Students' Night meeting, to be held May 10, 1951, will be "Transformations in Steel", a subject sure to be of interest to both students and A.S.M. members in the Philadelphia area.

WANTED
"The Book of Stainless Steels"

Urgent requests are frequently received for a copy of the A.S.M. book "The Book of Stainless Steels" (second edition), which is now completely out of print. Any owner of a copy in first-class condition who wishes to part with it for $5.00, please address: Editor, *Metals Review*, 7301 Euclid Ave., Cleveland 3, Ohio.

Welding Problems Threshed Out

At the November Meeting of Peoria Chapter Are (From Left): G. C. Riegel of Caterpillar Tractor Co. (Examining His Silver Certificate Representing 25 Years of Membership in A.S.M.); S. L. Hoyt, Speaker; E. F. Oeser of Acme Eyelet and Stamping Co., Also a 25-Year Member; D. E. McCowan, Technical Chairman; and T. H. Spencer, Chapter Chairman

Reported by R. L. Getz
Engineering Dept., Caterpillar Tractor Co.

"Problems of Welding Metallurgy" were threshed out before the November meeting of the Peoria Chapter A.S.M. by S. L. Hoyt, technical advisor at Battelle Memorial Institute. One of these problems has to do with brittle failures of ships and bridges, and the speaker described the research programs of the Ship Structures Committee and the N.R.C. Committee on Ship Steel, particularly as they have to do with tests of steel quality for use in welded ship construction.

Two types of tests involved are the so-called "weldability" tests of welded samples and notched-bar tests of the prime plate. Data were cited to show how a welded and notched test plate behaves. The welded plate was seen to fail first in the deposited weld metal which then dominated the test. The central crack thus formed propagated through the heat-affected zone and stock proper. Thus the weld metal initiates failure at a very early stage. In parallel tests of prime plate, the failure is initiated by the machined notch and at a relatively late stage.

Summing up, the speaker pointed out that the fracture processes of welded and unwelded ship plate are so different that a comparison of their results—the objective of weldability tests—is illogical. A true weldability test, aside from cracking, would show whether welding has deteriorated the quality of the steel in the heat-affected zone and made it more susceptible to failure. The prior failure of the weld metal vitiates any such comparison, and the test is simply a notched-bar test of the plate but of a new and unusual geometry.

Tests of the steel, with no weld, show widely variable behavior as the notch geometry is changed, thus paralleling the findings of the "weldability" test.

Finally, Dr. Hoyt noted the intimate relationship between design and steel quality required to insure satisfactory service life in the most economical way. Laboratory studies, including tests on full-scale hatch corners, have shown the vital role played by the deposited weld metal in initiating failure. Dr. Hoyt concluded by entering a strong plea for the inclusion of this triggering effect in studies of ship failure.

Pearlite Hardenability Coming Into Prominence

Reported by R. O. Kron
Metallurgist, Geneva Steel Co.

Hardenability is the ability to develop microstructures and not hardness, according to the definition given by M. J. Day, assistant metallurgical engineer, alloy steels, Carnegie-Illinois Steel Corp. Dr. Day, in his talk before the Utah Chapter A.S.M. on Oct. 17, then proceeded to show how various microstructures are obtained in the H-steels through heat treatment based on TTT-diagrams.

Application of the H-steels with the aid of hardenability curves was also discussed.

Hardenability is usually thought of in terms of martensite hardenability, the speaker mentioned. However, pearlite hardenability is coming into prominence in connection with plates and shapes in the as-rolled condition.

Pearlite hardenability is enhanced by obtaining a fine pearlitic structure through the addition of alloying elements and control of the cooling rates. The composition is adjusted so that high tensile properties are obtained in sections off the mill.

Plant Tour Shows How Foundry Personnel Work As Production Team

Reported by Kenneth B. Lloyd
University of California

General Metals Corp. of Oakland were genial hosts to a large turnout of the Golden Gate Chapter on Nov. 13th, when the doors of this modern steel foundry were opened for one of the most interesting plant visits of the current chapter year.

Well-instructed guides conducted small groups through the molding and melting departments. The tapping schedules for the 7½ and 20-ton electric steel melting furnaces had been arranged to provide a good show for the visitors. The pouring of the castings was closely followed, and the tour progressed through the shakeout and annealing departments, to end with a visit to the million volt X-ray and Magnaflux inspection laboratory.

After an excellent cocktail hour at the General Metals offices, the chapter adjourned to a nearby restaurant for the regular dinner meeting, conducted by Harry E. Lewis, head of Pyromet Furnace and Heat Treating Co. Phil Rodger, vice-president and general manager of the steel foundry for General Metals Corp., was the speaker and reviewed the operations of the foundry just visited.

He stressed the roles played in the foundry production team by the trained technician and by the skilled artisan; by the designer and the sand control man; the pattern maker and the molder; the metallurgist and the furnace melter; the X-ray operator and the casting cleaner. Mr. Rodger pointed out how the foundry needs each of these workers; they depend on each other, he said, to turn out the final product—the sound steel castings made by this large jobbing foundry.

The large number of Golden Gate student members was noted by Mr. Rodger in his talk, when he referred to the industry's need for qualified personnel to assume the management of the foundries in the distant tomorrow. Golden Gate Chapter, in line with its educational mission, has established a half-price dinner charge for its student members, and the increasing attendance of juniors at its meetings attests the wisdom of the policy.

The discussion session was indeed lively, and even a student question "Why is the green sand black?" helped to bring the Chapter to a better understanding of foundry problems and practices.

Transformation Data Explained, Illustrated

Reported by T. J. Phillips
Service Manager
Crucible Steel Co. of America

Speaking on "Transformation Data Applied to Heat Treatment", M. J. Day traced the origin of the S-curve from the iron-carbon diagram through the latest TTT-curves, and showed how the composition and architecture of the austenite dictates the shape of the curve. Dr. Day, who is assistant metallurgical engineer, alloy steels, Carnegie-Illinois Steel Corp., was speaker of the evening at the November meeting of the Detroit Chapter A.S.M.

Utilizing slides as a medium of presentation, Dr. Day illustrated the advantageous and deleterious effects of various transformation products on physical properties. As-rolled steel possessing "pearlite hardenability" was mentioned as a possible future automotive material.

M. F. Garwood, chief metallurgist, Chrysler Corp., acted as technical chairman and conducted an active discussion session following Dr. Day's talk.

The dinner meeting which preceded the lecture, was highlighted by a color movie, shown by Jim Henderson of Thompson Products entitled "Hunting Indian Style".

M. J. Day at Detroit

Nodular Iron Evaluated For Engine Castings Up to 2700 Lb. Weight

Reported by A. Floyd Whalen
Consulting Metallurgist

An evaluation of nodular cast iron as it is being used today by one company in the manufacture of engine castings weighing up to 2700 lb. was presented before the York Chapter A.S.M. at its Waynesboro meeting on Oct. 11. The speaker was W. R. McCrackin, assistant chief metallurgist, Cooper Bessemer Corp.

Mr. McCrackin first described and illustrated how the nodular structure is obtained, and showed slides comparing gray iron, malleable, and ductile nodular iron for tensile, yield, elongation and hardness. The high strength of the nodular iron as compared to the malleable iron, he pointed out, can be attributed to the nickel used as a carrier agent in the introduction of the magnesium to the melt. Without nickel, the nodular iron would compare about equally in physical properties to malleable; however, it is not possible to make large castings by the malleable process.

Specially selected pig iron is required for best results and each plant must adjust its alloy additions to balance its magnesium recovery. The higher the sulphur, for instance, the greater the amount of magnesium required, because of its affinity for sulphur.

With higher pressures, higher speeds and higher horsepower being steadily demanded by engineers for compressors and engines, gray iron will no longer fulfill all the demands and nodular iron is finding its way into a number of molds. It is also being used in the production of rolls, plowshares, pistons, wrenches, large hammer anvils and numerous other industrial castings.

For the present year an estimated 50,000 tons of nodular iron will be produced. However, it is a new material and at its present state of development Mr. McCrackin was of the opinion that it is not likely to disrupt either the steel or malleable industry in the near future.

Columbus Chapter Plans Heat Treating Lectures

Columbus Chapter A.S.M. has scheduled a series of four educational lectures on the fundamentals of heat treatment. The lectures will be given on Feb. 26 and 28, and March 12 and 14, 1951, at Battelle Memorial Institute.

Since only a limited number can be accommodated for the course, registration will be open to A.S.M. members only, until Jan. 31. After that date, registration will be opened to all qualified technical people on a first-come basis.

Arthur R. Elsea of Battelle Memorial Institute, chairman of the Columbus Chapter educational committee, is registrar for the course. Speakers and subjects are as follows:

Feb. 26—Characteristics of Metals, by J. W. Spretnak, associate professor of metallurgy, Ohio State University.

Feb. 28—Principles of Heat Treating Steel, by G. K. Manning, supervisor of metallurgical engineering, Battelle Memorial Institute.

March 12—Heat Treating Practice for Ferrous Metals, by R. E. Christin, chief metallurgist, Columbus Bolt and Forging Co.

March 14—Ferrous and Nonferrous Heat Treating Practice, by C. S. Thomas, chief metallurgist, Jeffrey Mfg. Co.

Heat Resistant Castings Cannot Be Cheaply Made Talbot Tells New Jersey

Reported by J. M. Loiacono
Chief Metallurgical Engineer
Eclipse-Pioneer Div., Bendix Aviation Corp.

The ideas of many customers that heat resistant alloy castings should be cheap in price were dispelled by D. W. Talbot of Cooper Alloy Foundry Co., talking before the New Jersey Chapter A.S.M. on Oct. 16. Such disadvantages as use of expendable molds, high grinding and finishing cost, considerable wastage in gates and risers, and the fact that it is a one-shot process all contribute to manufacturing expense.

Mr. Talbot discussed the relative merits of various melting furnaces for stainless steel, including arc and induction methods. With the use of oxygen, the arc furnace is growing in importance, he said, because it produces low-carbon stainless from high-carbon scrap, which is relatively more abundant than the low-carbon grades.

Properly made castings are true engineering materials, said Mr. Talbot; they give a close approximation to the finished part, with consequent saving in machining costs. They do not possess directional properties, with resultant planes of weakness. They can be produced in a number of analyses not possible in the wrought products.

Recent developments in the casting industry have been along the line of improving quality. The wider use of X-ray inspection has lowered cost by determining the best stress practical for sound castings. Further savings are effected by X-rays in rejecting defective material prior to high-cost machining operations.

Other developments which have reduced foundry costs include powder and friction cutting of gates and risers, use of steel wire shot for blasting, submerged tumbling for final cleaning and polishing, and dielectric heating for baking cores.

One of the speaker's most important points was that the customer should consult the foundryman before settling on the final design of a casting. Often the foundryman can recommend improvements, point out ways to decrease cost, or suggest a better way of obtaining the desired finished part.

Micellar Theory Of Solid State Opens New Doors

Reported by A. R. Deir
Mining Engineer, Bureau of Statistics

"A New Theory for the Solid State"—a highly technical subject, much of it still in the theoretical stage—was presented from the standpoint of experimental observations by Carl A. Zapffe, consulting metallurgist, addressing the metallurgists and scientists of the Ottawa Valley Chapter A.S.M. on Nov. 7. These observations are of direct concern to important practical and commercial problems, Dr. Zapffe pointed out—for instance, gases in metals, fractures of metals, and the nature of toughness.

Studies of the behavior of hydrogen in steel have proved that the gas is contained in the steel in the form of entrapped pockets. These pockets lie along crystal planes important in mechanical deformation, and precipitation of the gas at these positions may lead to pressures exceeding the strength of the strongest steels.

Next, the speaker told how the new microscope technique "fractography" was a natural consequence of a strong curiosity regarding some subtle features which can best be described as an internal architecture within the grain. Magnifications as high as several thousand times showed many new and intriguing evidences of special structures contained within the grain.

Dr. Zapffe proceeded to draw these many observations together and to show that their explanation virtually demands a new understanding of the fundamental constitution of the solid state. A "micellar" constitution was proposed to serve at least as a tentative working hypothesis. The "micellar theory" is based upon the premise that a colloidal condition universally obtains, even in homogeneous phases such as a pure metal.

If the concept is correct, the speaker went on to show, then solids such as metals have a strength which is determined by the cohesive forces holding micelles together, and not by direct atomic forces. The difference of the two is in the order of 100 to 1. This in turn accounts for the fact, derived from a number of sources, that the experienced strength of metals is only a few per cent at best of what it might be, based upon its inner atomic cohesion.

While a successful construction of the theory would open a new and promising door to exploration of engineering materials with unheard-of strengths, the speaker was careful to emphasize that the micellar theory is but one of many in this important field today. Much research remains to be done before it can be either proved or disproved.

Eastern New Yorkers Hear Jominy

At National Officers' Night of the Eastern New York Chapter, Walter E. Jominy (Left), A.S.M. President, spoke on "Tempering as Affected by Hardenability". Center is Chapter Chairman John F. Eckel and at right is National Secretary W. H. Eisenman. (Reported by A. Lesnewich)

Necessity for Steels of Drawing Quality Depends On Processing Operation

Reported by Wm. M. Cade
French & Hecht Division
Kelsey-Hayes Wheel Co.

Approximately one-fourth of the nation's steel production is utilized in the form of sheet or strip, according to Robert S. Burns, research engineer for Armco Steel Corp. Mr. Burns gave the technical address before the Tri-City Chapter A.S.M. on Oct. 3, on the subject of sheet steel. After a brief review of the various methods of making sheet steel, he confined his attention to the effect of processing upon the final product.

A sheet which will be free of stretcher strains and have stable drawing qualities lasting indefinitely can be produced from an ingot of killed steel, by cold reducing more than 30% and by the use of box annealing and temper rolling operations. Rimmed steel, on the other hand, is subject to stretcher strains under certain conditions, particularly if put in storage for periods of six months or longer.

There appears to be no universally satisfactory test of drawing quality, the speaker emphasized, since drawing involves stretching, ironing and upsetting in various proportions dependent upon the part being made. Slides were used to illustrate the fact that, with a given carbon content, various grain structures and Rockwell hardnesses can be obtained by various methods of reduction.

In making a steel of "drawing quality" as opposed to "commercial quality", Mr. Burns explained, the steel companies undertake to produce a steel that has more uniform physical and chemical properties, better surface properties and is more uniform as to gage. The net result is more uniform quality in the die and a reduction in scrap loss.

The question and answer period following the talk centered chiefly on the substitution of commercial quality steel for drawing quality. Here again the speaker emphasized that the drawing properties required may vary through a considerable range. Since there is no quantitative way of measuring the drawing quality of a piece of steel, the true test is the die. It either makes the part or it does not. However, there are numerous parts that can be made of commercial quality steel without appreciably higher scrap rates.

Prof. Cohen Draws Top Attendance at Dayton

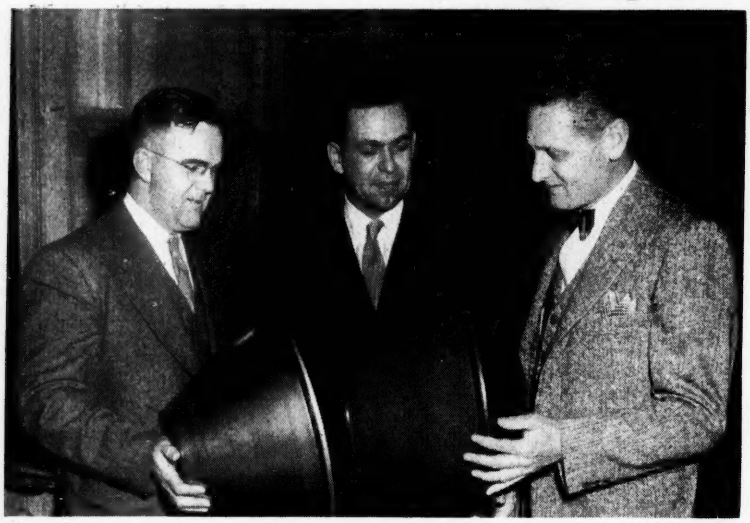
Reported by James W. Poynter
Metallurgist
Wright-Patterson Air Force Base

The largest group attending a Dayton Chapter meeting in several years was present at the Engineers Club on Nov. 8 to hear Morris Cohen, professor of physical metallurgy at M.I.T., present a talk on "The Heat Treatment of Steel".

Dr. Cohen briefly presented the fundamental changes involved in hardening, using a typical "C" curve with the martensite transformation lines added. With this background, he discussed the tempering operation in detail, using data from the usual low-carbon alloy steels, high-carbon steels, toolsteels, and steels of special compositions to illustrate the points. Included in the talk were the effects of refrigeration, the effect of retained austenite on the properties, and some methods for control of dimensional stability.

Dr. Cohen's talk is reported in detail on page 6. As a prelude, the film "Dust or Destiny" was shown.

Things to Come Will Be Metal Spun



Examining the Exterior of Two Metal Television Tubes Made by Spinning Are, Left to Right: Harold B. Bell, Plant Manager, Worcester Stamped Metal Co., Technical Chairman for the November Meeting of Worcester Chapter, Lyndon B. Burnham, Sales Manager, Roland Teiner Co., Inc., Everett, Mass., who spoke on "Metal Spinning", and Robert S. Morrow of George F. Blake Inc., Chapter Chairman (Courtesy of Worcester Telegram)

Reported by C. Weston Russell
Chemist, Wyman-Gordon Co.

The shape of things to come will be metal spun, predicted Lyndon Burnham, sales manager for The Roland Teiner Co. of Everett, Mass., at a meeting of the Worcester Chapter A.S.M. on Nov. 8.

Explaining that several industrial trends foreshadow this prediction, Mr. Burnham said, "We are working for the consumer more than ever before in the history of industry." When consumers wanted five million television sets in two years, industry produced them. When they wanted larger picture tubes, industry made them.

The real question in considering the shape of things to come reduces itself to the probable demands of these consumers.

Guided missiles, jet planes and modern streamlined equipment of all sorts are demonstrating that the principles that lead to better air-stream designing inevitably require symmetrical shapes and forms adaptable to spinning.

In a sense, today's age of speed is concentrating consumer demands toward products designed for speed, and with lines harmonious with speed. Our job, said Mr. Burnham, seems to be to anticipate this demand for more speed—and to develop the metallurgy, the metals and the products that will speed the age of speed.

The spinning shop is in the front line on this job, according to the speaker. Spinning, which has proven so adaptable to the production of experimental models, is coming to the forefront as the fabricating method where the newest metals meet the newest designs.

Wide Use of Titanium in Experimental Structures Predicts Commercial Future

Reported by Sheldon Rideout
Research Fellow, University of Notre Dame

The intense interest in titanium which has been aroused in the past few years results from the very attractive properties of the pure metal, said Bruce W. Gonser, speaking before the Notre Dame Chapter A.S.M. at its October meeting. Dr. Gonser is supervisor of nonferrous metallurgical research at Battelle Memorial Institute.

Titanium's high strength and ductility, coupled with great corrosion resistance and light weight, make it especially interesting to the Armed Forces, he continued. The ratio of yield strength to density of some titanium alloys is somewhat better than that of stainless steel and also of the higher-strength aluminum-base and magnesium-base alloys. From the standpoint of corrosion resistance, titanium is as good, and in many cases, better than stainless steel.

Dr. Gonser pointed out that although titanium ranks very high in the order of abundance on the earth, its high melting point and great chemical affinity for almost everything have been limiting factors governing the production of sizable quantities of really pure titanium. Consequently, all of the pure titanium metal produced thus far in this country has been used only for research to study the chemical and mechanical properties and to determine the alloying characteristics. The commercially pure metal and alloys are being used in a large range of experimental structures.

Numerous slides were shown, illustrating various laboratory and industrial techniques of refining titanium metal. Dr. Gonser concluded his talk by pointing out that there is a great future for titanium and titanium alloys. We will all do well to follow the development of this metal and its possible practical applications.

Canadian Nickel Operations Outlined

Reported by John H. Bradbury
Algoma Steel Corp., Ltd.

Operations of International Nickel Co. in Canada were outlined by Gordon Farnham, assistant manager of Canadian development for the company, in a talk before the Northern Ontario Chapter A.S.M. in Sault Ste. Marie on Nov. 22. In introducing Dr. Farnham, Chapter Chairman Walter C. Kimball made the statement that Northern Ontario, with 104 members, is now the second largest of Ontario's four A.S.M. chapters.

Although nickel was discovered in Canada nearly 200 years ago, according to Dr. Farnham, mining of the metal was not started until 1877, the first deposits being sold to manufacturers in Swansea, South Wales. The Sudbury deposits were first uncovered by the Canadian Pacific Railroad in 1883, and vast mining projects are now operating.

Nickel has a special advantage in contributing heat and corrosion resistant properties; for this reason its alloys have application in combustion tubes and turbine blades for jet engines. Condenser tubes and propeller shafts such as used by the U. S. Navy constitute a further application.

During World War II more nickel and copper were produced than in the previous 54 years, Dr. Farnham continued. During this period a billion and a half lb. of nickel and 1¾ billion lb. of copper were produced to meet wartime demand.

Dr. Farnham concluded his address by saying that in the present nickel shortage the International Nickel Co. of Canada is trying in every way to give a fair deal to all its customers. A system of rationing has been evolved whereby allocations are made on a percentage basis. This, Dr. Farnham believes, is the most honest and practical arrangement possible.

Gives Rules for Minimizing Headaches In Heat Treatment

Reported by James H. Brown, Jr.
Metallurgist, Ritter Co., Inc.

"Minimizing Heat Treating Headaches" was the title of a lecture that brought out a near-record turnout of the Rochester Chapters of both A.S.M. and the American Society of Tool Engineers on Nov. 13. Norman O. Kates, production metallurgist of the Lindberg Steel Treating Co., stressed the desirability of cooperation between the tool designer, supplier, toolmaker and heat treater as his principal theme.

Three factors which would simplify heat treatment are design, fabrication, and toolsteel selection. Mr. Kates presented a wealth of practical heat treating tips, from the effect of prior cold working to the final grinding and straightening.

By bearing in mind that the principal stresses in tools and dies are caused during fabrication and quenching, designers could minimize heat treatment troubles, Mr. Kates pointed out. Eight recommendations for proper design were then presented.

Turning to steel selection, Mr. Kates actively endorsed conferring with the toolsteel supplier and heat treater. He further suggested use of a few standard grades of steel to allow for more complete familiarization with the properties and action of each during hardening.

If a die has been severely hogged or milled in machining, Mr. Kates cautioned that stress relieving should be done prior to hardening. The use of deep stamp marks should be discouraged. In both cases, a notch effect is produced.

Prior to heat treatment, all mill decarburization must be removed from the steel; otherwise the differences in contraction and expansion of the decarburized areas and parent metal can cause warpage and cracking. Mr. Kates recommended that a spark test for decarburization be made part of the heat treating procedure for all dies.

As for the heat treatment itself, headaches can be minimized by holding to minimum temperatures required to obtain hardness. Preheating or use of minimum heating rates will cut soaking time requirements, and is still the best practice.

The quenching medium must be ample. Mr. Kates recommended brine for water hardening steels to avoid soft spots and possible ensuing distortion or cracks. Flush quenching of pockets is important. From the quench, tools or dies must be allowed to cool close to room temperature before being drawn; however, the draw must follow very shortly after the tools have completely cooled.

Straightening should be done while the tool or die is hot from the quench, and must be done while the tool is actually hardening or between the M_s and M_f points on the transformation curve. Clamps, plates and pins should be used to maintain straightness during drawing.

Service Data Illustrate Savings Effected by New Uses for Aluminum

Reported by George A. Fisher, Jr.
International Nickel Co., Inc.

New uses of aluminum are typified by structures such as the Arvida Bridge in Canada, in which a 50% weight savings was effected, according to Hiram Brown, chief metallurgist of the Solar Aircraft Co. Mr. Brown addressed a joint meeting of the St. Louis Chapter A.S.M., the American Society for Testing Materials, and the St. Louis Engineers' Club in November. Service data on the use of aluminum in bearings, for constructional parts of machinery, and in architectural applications were presented.


Hiram Brown

Mr. Brown traced the development of the aluminum-silicon-copper and aluminum-silicon-magnesium casting alloys, particularly the 319 alloy for sand and permanent mold castings and the 380 and 384 alloys for die castings. The aluminum-zinc-magnesium alloys, known as the Frontier 40 alloys, have been developed over the past ten years, he said. Among the wrought alloys, the 75S and R-303 types were covered in detail.

Turning to processing, Mr. Brown pointed out the changes that have occurred in the casting field. The higher percentage of permanent mold castings produced has been accompanied by a drop-off in the percentage of sand castings. It is the speaker's opinion that the permanent mold and die casting volume is penalized because of the producers' refusal to exchange information regarding these processes. The general quality of aluminum castings was raised by the enforcement of X-ray and other quality control measures during the war period.

Other processes such as stepped extrusion, spin dimpling, soldering, brazing and welding, were described, and ramifications of surface treatment, including anodizing and coloring, were explained.

Mr. Brown completed his talk with a discussion of the heat treatment of aluminum, stressing the effect of quenching rate. The subject of heat treatment was coordinated with the development of alloys to provide certain mechanical properties or characteristics which are amenable to specific fabrication or processing.

Bert Sandell Dies Of Heart Attack

Bert E. Sandell, metallurgist and assistant superintendent of the Stewart Die Casting Division of the Stewart Warner Corp., died of a heart attack on Nov. 14, 1950. He had been ill and working only part time for just a year.

Mr. Sandell's entire industrial experience was with Stewart in the die-casting industry. Starting in as an assistant chemist, he earned a bachelor degree in chemistry at Lewis Institute the hard way, going to school nights and part time. By dint of sheer ability and industry he worked his way up to positions of authority and responsibility in the die-casting industry.

He had served as chairman of the Chicago section of the A.I.M.E. and had been on the Executive Committee of the Chicago Chapter A.S.M. He was, at the time of his death, chairman of the Technical Committee of the American Die Casting Institute. He was also secretary of Subcommittee II of Committee B-6 of the A.S.T.M. on zinc-base alloy die castings. During the war he was a member of the Technical Industry Advisory Committee of the War Production Board and headed up the Coordinating Committee on the production of magnesium incendiary bombs.

Bert had more than the usual number of friends throughout the nonferrous metal industry. They will miss him as a sincere, hard-working metallurgist and a reliable, loyal friend.

D.L.C.

Arthur Wells

Arthur Wells, who was associated with the Horace T. Potts Co. for over 20 years, and was a long-time member of the Philadelphia Chapter A.S.M., died in December.

Burrell Offers New Catalog

The Burrell Corp., Pittsburgh, manufacturers and suppliers of laboratory chemicals and scientific equipment, has announced a new catalog which constitutes an up-to-date reference work on all kinds of laboratory apparatus and supplies. It lists over 25,000 items and includes many improved methods and aids for chemical analysis and testing. The catalog contains 986 pages plus the index, weighs about 7 lb., and is bound in durable green leather. Free copies are available to laboratories of all kinds. Send written request on your letterhead for catalog No. 450 to Burrell Corp., 2223 Fifth Ave., Pittsburgh 19, Pa.

New Haven Members Inspect Scovill's New Continuous Mill

Reported by P. E. Petersen
Superintendent of Maintenance & Repair, Chase Brass & Copper Co.

Scovill Manufacturing Co. graciously opened the doors of its new continuous strip mill to the members and guests of the New Haven Chapter A.S.M on the afternoon of Oct. 19. Approximately 200 were taken through the mill in small groups by competent guides. W. D. France acted as official host for the Scovill Co.

The group then assembled at the Waterbury Club for the dinner and technical meeting, addressed by John J. Hoben, works manager of the mills division for Scovill.

Mr. Hoben gave a brief account of the early work of his company in perfecting and starting the continuous casting process, and in planning and finally building and putting into operation this most modern brass strip mill. He outlined how they had set a definite goal of highest quality, most efficient operation and lowest production cost, and had built (at a cost of $10,500,000) the mill to meet those requirements. Briefly, the operations and equipment in the new mill are as follows:

The metal is melted in three 1000-kw. Ajax-Scomet induction furnaces. Each has a holding capacity of 22,000 lb. of metal, and a melting rate of 10,000 lb. of brass per hour. The charges are fed to these furnaces by a vibrating feed hopper. When ready to pour, the molten metal is transferred by crane and a 5000-lb. capacity ladle to the holding furnace of the continuous casting machine, which is of the Junghans-Rossi type. This holding furnace has a capacity of 9000 lb. of molten metal, and has a 120-kw. Ajax induction unit to maintain temperature.

Metal flows from the tilted holding furnace through a downspout into a vertically reciprocating water-cooled copper mold. Flow is controlled by a needle valve in the downspout. The solidified bar discharges below, where it is cut to desired length by a circular saw traveling downward at the same speed as the casting. The slabs are cast in widths up to 29 x 2½ in. thick, and sawed to bars weighing about 2000 lb. The bars then go to the new strip mill.

Here they are broken down in a large two-high cold rolling mill, and with intermediate annealing and pickling are further run down and finished on two large four-high mills. With complete mechanized handling on both sides of the mills, using vacuum cup pilers and unpilers, and power roller tables, a minimum of manpower is required.

Annealing is done in four continuous roller-hearth propane-fired furnaces equipped with spray cooling chambers. Flat bars ride directly on rolls and coils are carried on circular alloy trays. Pickling is done on two spray pickling units of special Scovill design at speeds up to 600 ft. per min. The wide strip is slit and inspected on both sides at a rate of 60 to 240 ft. per min.

Technical Papers Invited

The Publications Committee of the A.S.M. will now receive technical papers for consideration for publication in the 1952 *Transactions.* A cordial invitation is extended to all members and nonmembers of the A.S.M. to submit technical papers to the society. Many of the papers approved by the committee will be scheduled for presentation on the technical program of the 33rd National Metal Congress and Exposition to be held in Detroit, Oct. 15 to 19, 1951. Papers that are selected for presentation at the Convention will be preprinted and manuscripts should be received at A.S.M. headquarters office not later than April 10, 1951.

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Headquarters should be notified of your intention to submit a paper, and helpful suggestions for the preparation of technical papers will be sent.

Louisville Hears Hoyt

Reported by W. B. Moore
Technical Service Engineer Reynolds Metals Co.

The season's third meeting of the Louisville Chapter A.S.M. took place on Dec. 5 at Kapfhammer's Party House. Following a fine steak dinner, Bernard "Peck" Hickman, varsity basketball coach, University of Louisville, gave a coffee talk that succeeded in infesting the members with enthusiasm for the University's athletic program.

Speaker of the evening was S. L. Hoyt, technical advisor, Battelle Memorial Institute. His informative talk on the "Metallurgy of Welding" is reported in detail on page 7. As the chairman, George Perkins of Reynolds Metals Co., so aptly commented at the close of the meeting, the number of questions and the interest shown during the talk were evidence that this meeting will be one of the highlights of the current lecture season.

British Columbians See Jet Engines At Air Force Station

Reported by W. M. Galt
Sumner Iron Works, Ltd.

The Royal Canadian Air Force Station at Sea Island, B. C., was the scene of the first field visit of the 1950-51 season for the British Columbia Chapter A.S.M. The party was welcomed by Squadron Leader R. D. Forbes-Roberts, who outlined the evening's program.

First item on the agenda was a film by General Electric Co. entitled "Jet Propulsion". This film depicts the advent of the airplane in the days of the Wright Brothers, and traces its development to the latest types of airscrew-driven planes and finally the rapid conversion to jet propulsion. The points stressed in the film were then enlarged upon by Flight Sergeant R. C. Parker, who demonstrated a complete Goblin jet engine, supported on a trolley before the group.

Starting at the front end of the engine F/Sgt. Parker explained how air is drawn in by the impeller, compressed and directed to the combustion chambers, where kerosene is injected and combustion takes place. The rapidly expanding gasses are expelled rearward through the small end of the combustion chamber, through the guide vanes, to the blades of the turbine. The turbine and the impeller are both on the same shaft; thus, the faster the turbine turns, the greater the amount of air drawn in, increasing the engine speeds up to the controlled maximum r.p.m. of 10,200.

A few of the interesting details brought out by the speaker are that the engine idles at 3000 r.p.m. and has a top governed speed of 10,200 r.p.m. It can burn gasoline or kerosene but the latter is used for economy. Three hundred gallons of fuel are carried in the wings and the fuselage, giving the aircraft 1 hr., 20 min., flying time; greater range may be secured by the addition of extra drop tanks.

The power rating of jet engines is figured in pounds thrust and the static thrust of a Goblin engine is 3000 lb. Quick conversion from pounds thrust to horsepower is obtained by doubling the thrust figure, thus giving this engine a horsepower of 6000.

At the close of the lecture and question period, which was ably taken care of by F/Sgt. Parker, the party looked over a number of Vampire jet fighters standing in the hangar before dispersing. It was a most educational and enjoyable evening.

Electroplaters Meet With Metallurgists

Walter R. Meyer (Left) of Enthone, Inc., Addressed a Joint Meeting of the A. S. M. and the American Electroplaters Society in Philadelphia. Center is Joseph Gray Jackson, chairman of the Philadelphia Chapter A. S. M., and at left is Samuel Heiman, president of the A. E. S. group

Reported by George L. Schiel
Metlab Co.

At a joint meeting designed to stimulate common interests, electroplaters and metallurgists of the Philadelphia area heard Walter R. Meyer, president of Enthone, Inc., discuss the "Metallurgical Aspects of Electrodeposited Coatings."

Discoursing on structures of electrodeposited coatings, Dr. Meyer explained that the direction of crystal growth is perpendicular to the base metal. Crystals grow in columns similar to the dendrites formed at right angles to the mold wall when cast metal solidifies in the ingot. The coating thus tends to reproduce the crystal size of the base metal even if not of the same crystal structure.

Adhesion quality has been improved, according to Dr. Meyer, to a point where the weaker metal will fail rather than the interface.

Thermal diffusion of electroplated coatings into the basis metal may increase the bond strength, although sometimes the strength may be decreased. For instance, in copper coatings on zinc-base die castings, the copper diffuses into the zinc with the formation of a brittle alloy zone. Thin copper coatings on zinc-base die castings may actually disappear because of the formation of light-colored zinc-copper alloys when the parts are subjected to temperatures from 300 to 400° F.

Stresses may exist in electrodeposited coatings, and Dr. Meyer stated that coatings with high stresses must be placed on base metals of sufficient strength to resist the imposed tensile stresses, if shrinkage cracks are to be avoided.

Of particular interest to the metallurgists present was Dr. Meyer's statement that the hardness of coatings deposited under certain controlled conditions can exceed that of the metal in its cast or wrought form. This additional hardness he attributed variously to small grain size, residual stress, preferred orientation or impurities acting to produce dispersion hardening.

An unusual feature of electrodeposited alloy coatings is that, for an over-all chemical analysis, the observed structure may not correspond to that found on the conventional constitution diagram.

Philip H. Permar of the Du Pont Company entertained at dinner with a display of magic.

Compliments

To HENRY G. KESHIAN, a past national trustee of A.S.M. and a past chairman of the New Haven Chapter, on his retirement after 33 years as metallurgist with Chase Brass & Copper Co. Mr. Keshian will henceforth do consulting work.

♦ ♦ ♦

To R. M. BRICK, department of metallurgical engineering, University of Pennsylvania, on his election as chairman of the Institute of Metals Division, American Institute of Mining and Metallurgical Engineers; and to T. L. JOSEPH, assistant dean, Institute of Technology, University of Minnesota, Minnesota School of Mines and Metallurgy, on his election as chairman of the Iron and Steel Division, A.I.M.E.

♦ ♦ ♦

To BURNIE L. BENBOW on completion of 41 years of continuous service with the Cleveland Wire Works of General Electric Co. Mr. Benbow retired as manager of the Wire Works last August.

♦ ♦ ♦

To EDWARD A. LIVINGSTONE, vice-president in charge of sales for Babcock & Wilcox Tube Co., on his appointment to the Steel Products Industry Advisory Committee, established by the National Production Authority of the U. S. Department of Commerce.

No Pushbutton Oil Well Drilling

Reported by John F. Puterbaugh
Midwest Research Institute

There is no push-button method in the near future for drilling deep oil wells, said H. Maurice Banta, supervising engineer of ferrous metallurgical research at Battelle Memorial Institute, speaking before the Kansas City Chapter A.S.M. Drilling rigs in use today are capable of drilling to a depth of over 20,000 ft., and no change is indicated in the present construction.

Mr. Banta presented a very interesting resume of the many metallurgical problems encountered in drilling deep oil wells, illustrated by a series of slides showing the various parts used in the drill string.

The speaker pointed out locations of failures, probable or known causes and corrections. The major difficulties experienced with drill pipe are wear—excessive reduction of wall thickness caused by the abrasive action of the hole wall—and twist-offs, which may result in costly fishing operations. Twist-offs can usually be attributed to pure fatigue or corrosion fatigue. In the latter instance, the stress-raiser is a corrosion pit.

Various means of reducing corrosion include protective coatings and techniques common to the corrosion field. Failures may also occur in accessory parts of the drill stem. These include the tool joints — couplings connecting separate sections of pipe and subject to galling and wobble—and drill collars—heavy-walled sections of pipe used at the end of the string to give added weight to the bit and to keep the string in tension. The collars are subject to the same type of failures as are other members of the string.

Many familiar steels are used in the make-up of a drill string, as well as a few special types similar to common steels but especially made for the application.

Much research is in progress to alleviate the causes of drill-string failures, the speaker said, and therein lie the improvements in the drilling operation.

Resistance Welding Contest

The Resistance Welder Manufacturers' Association has officially announced the beginning of a new contest for original papers dealing with resistance welding subjects. A total of $2250 in prizes will be awarded. The contest judges will be appointed by the American Welding Society, and awards will be made at its 1951 fall meeting. The contest closes July 31, 1951. Complete rules may be secured from the Resistance Welder Manufacturers' Association, 1900 Arch St., Philadelphia 3, Pa.

Instrument Sales Show Rapid Growth Of Ultrasonic Testing

Reported by Ernest C. Kron
Metallurgist, Doehler-Jarvis Corp.

The rapid growth of ultrasonic testing in recent years is reflected in the sales of the supersonic "Reflectoscope," Mr. Robert Snowdon of Heppenstall Co. claimed in a talk before the Nov. 16th meeting of the Toledo Chapter A.S.M. on "Nondestructive Testing." In 1949 more instruments were sold than the entire total up to that date, he said, and the 1950 sales have already surpassed the total for 1949.

The outstanding advantages of ultrasonic testing are the simplicity of the test, the thickness of steel which can be penetrated by the ultrasonic beam, and the ability to locate the defect accurately. The test is limited in respect to shapes tested, however. Steel blocks with parallel sides are the easiest; as the piece being tested varies from this shape, it becomes more difficult to test.

Mr. Snowdon showed slides of very large forgings which had been found defective and later fractured to show the defect. One outstanding example was a large roll forging in which a defect was found close to a section which was to be machined out on finishing. With the defect accurately located, it was possible to save this large forging by reforging, so that the entire defect was machined away from the finished roll.

Ultrasonic testing enables the steel supplier to give his consumers the steel they know will adequately meet their individual requirements. Salesmen report that the use of ultrasonic testing has greatly reduced complaints regarding defective steel, Mr. Snowdon said.

The speaker concluded by describing briefly a new method of ultrasonic testing which gives a visual picture of the actual size and shape of a defect.

Safety Precautions in Use Of Tracers Emphasized

Reported by W. R. Hibbard, Jr.
Department of Metallurgy, Yale University

The requirement for adequate safety precautions, equipment and procedures was the keynote of the Nov. 16th lecture by C. Ernest Birchenall of the Metals Research Laboratory, Carnegie Institute of Technology, before 70 members of the New Haven Chapter on the subject of "The Application of Radioactive Tracers to Metallurgy".

Dr. Birchenall emphasized that the average metallurgical laboratory is not equipped to handle the melting, casting, fabrication and testing of radioactive materials, and should not attempt it until prepared to make an extensive capital investment for safety's sake.

In starting his lecture, Dr. Birchenall explained isotopes, how they are made, why they dissipate energy, and how this dissipation of energy can be measured as a "tracer". Then he discussed the hazards involved in handling radioactive materials and the safety precautions required. The remainder of the lecture was devoted to applications of tracers to metallurgical studies such as self-diffusion, slag equilibria in steelmaking, activities and vapor pressure investigations, corrosion, segregation, thickness measurements, and lubrication and seizing studies.

New Films

Western Steel

"Strength in the West" is the title of a 22-min. motion picture by Kaiser Steel Corp., which explains the making of steel from the mining of iron ore and coal to the rolling of semifinished and finished products. It is a 16-mm. film in color and sound. Showings can be arranged by writing to the Public Relations Department, Kaiser Steel Corp., 1924 Broadway, Oakland 12, Calif. Requests should be submitted approximately ten days in advance of the intended showing date.

Copper Mill

Riverside Metal Co. has announced a new 16-mm. industrial film entitled "Quality Mill". It shows the production of phosphor bronze, nickel silver, cupronickel, and beryllium-copper alloys from initial casting all the way through final inspection and shipping. Latest production equipment, particularly two new rolling mills, is shown in action. The film can be obtained by writing to A. G. Dennison, assistant general sales manager, Riverside Metal Co., Riverside, N. J.

Aircomatic Welding

Air Reduction Sales Co. has announced the completion of a Kodachrome sound-motion picture which tells the story of the new Aircomatic process for welding aluminum, stainless steel, bronzes and monel. By exceptional closeup photography of the Aircomatic arc, actual deposition of weld metal and much detail in the arc are brought to the screen. Other aspects of the process are explained by means of animation and demonstration.

Showing time for this 16-mm. two-reel picture is 21 min. Arrangements for showing can be made through the nearest Airco office or by writing direct to Air Reduction, 60 East 42nd St., New York 17, N. Y.

Four Types of Failures Complicate Selection Of Bearing Materials

Reported by John C. Wagner
Indianapolis Naval Ordnance Plant

Arthur F. Underwood, of the Research Laboratories Division, General Motors Corp., showed the Indianapolis Chapter A.S.M. on Nov. 20 that he could present a highly technical subject and at the same time keep his audience entertained. In what appeared to be a relatively short time, several of the most important principles involved in the "Selection and Testing of Bearing Materials" were clearly explained. This was followed by a color movie dealing with some of the fundamentals of lubrication.

The speaker brought with him a variety of slides that showed photographs of typical bearing failures. Four of the most important types of failure are by corrosion, fatigue, scoring, and cracking by deformation under load.

For example, the mystery of the corroded bearings was solved by finding acid in the lubricating oil. The cause of fatigue, which starts as surface cracks that work their way through the bearing, is unknown. When melting takes place as a result of frictional heat caused by seizure, the failure is called scoring.

Unfortunately there is no material that possesses the maximum resistance to all these types of failure. A material having high fatigue resistance usually has low resistance to scoring, and vice versa. The same is true of resistance to corrosion and deformation. Different types of bearings require different combinations of properties. The engineer must base his materials selection upon a compromise between the most important properties desired.

National Officers at New York

Reported by Frank D. Malone
Washburn Wire Co.

November 13 being designated National Officers' Night for the New York Chapter, the members had the pleasure of hearing Walter E. Jominy, president of the Society, and W. H. Eisenman, its executive secretary.

Mr. Jominy, staff engineer of the Chrysler Corp., spoke on the mechanism of wear and the methods by which its effect can be reduced. Drawing upon his many years in the automotive industry, Mr. Jominy's lecture was highly informative and was very well received by the group.

Mr. Eisenman gave a resume of the activities of the Society and some related statistics. Interspersed in the talk were many of Bill's justly famous stories which contributed much to the enjoyment of the evening.

Editor Speculates on Present and Future Of Atomic Energy

Reported by D. J. Girardi
Metallurgical Department
Timken Roller Bearing Co.

"Should the atom bomb have been dropped?" Starting with this thought-provoking question, Ernest E. Thum, editor of *Metal Progress,* proceeded to outline the present status and future developments of atomic energy in his talk "Implications of Atomic Energy" presented at the Oct. 9th meeting of the Canton-Massillon Chapter A.S.M.

Historically, the gathering of basic information which led ultimately to the explosive splitting of the atom goes back many years. The first evidence of the divisibility of the atom and the first realization of the alchemists' dream of transmutation came into being with the discovery of radioactivity. Physicists since then have continuously developed the knowledge on the structure of the atom from the standpoints of the particles (protons, electrons, neutrons) that constitute the atom and the general arrangement of these particles. A sort of planetary type structure is visualized, having the majority of the mass concentrated at the center about which electrons are grouped in definite "shells" or orbits.

Atomic energy became a vital force in the affairs of men when the heaviest metal, uranium, was bombarded with neutrons causing it to split into other elements of somewhat lesser total mass, converting the difference into a tremendous amount of energy. In one sense it is this tremendous release of energy that distinguishes a nuclear reaction from a chemical reaction. The energy released in the splitting of uranium arises from the fact that the reaction is not equitable on a weight or mass basis and this discrepancy in weight represents the mass that is converted into energy in amounts predictable by Einstein's equation $E = mc^2$. (The "c" in this equation is a *very* large number—the velocity of light.)

When the uranium atom splits, more neutrons are produced than are required to cause the action, and these extra ones are available for bombarding other uranium atoms, if they do not fly away out of the reacting mass before they are absorbed. There is consequently a critical size of the mass of uranium above which the reaction becomes self perpetuating (a "chain reaction") and it is this characteristic that places a size limit on the atom bomb. A small amount is perfectly safe—most of the neutrons constantly produced escape harmlessly to the surrounding air. Join two such sub-critical masses into a super-critical mass, and an explosion is instant. To control the rate of reaction and release of energy, as would be necessary in an industrial application, the amount of neutrons or "neutron flux" would have to be controlled by use of harmless neutron absorbers such as graphite.

The applications of atomic energy in the military field, as a powerful tool for research and as a source of industrial power, are all imminent. At present, the military aspects of atomic energy are being emphasized. The use of atomic energy in the form of tracers in research is well under way and being expanded, especially in the field of medicine and biology. The use of atomic energy as a source of industrial power is being actively investigated by the U. S. Atomic Energy Commission's staff, but its economic realization, stated Mr. Thum, is a matter for the future, when many important questions concerning properties of necessary materials have been answered.

Ryerson Moves Into New Plant

Joseph T. Ryerson & Son, Inc., steel distributors, have moved into their new and larger steel-service plant and office building in Cincinnati, construction of which was begun last January. The new plant, located at 3475 Spring Grove Ave., represents an investment of well over $1,000,000. Total floor space is 165,000 sq. ft., or almost four acres.

Mg Alloy Systems Explained Applications Described

Reported by W. B. Moore
Technical Service Engineer
Reynolds Metals Co.

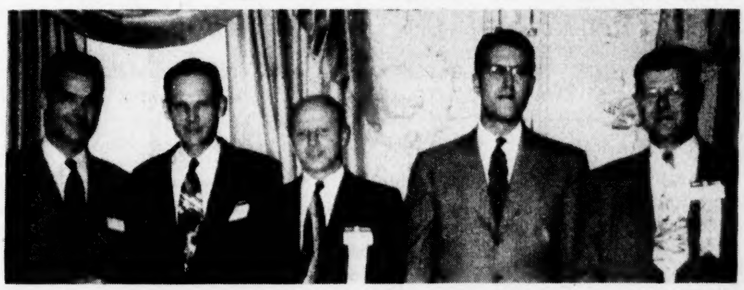
The program of the Louisville Chapter's November meeting opened with an interesting and entertaining film produced by Ford Motor Co. Entitled "Six Thousand Partners", this movie graphically illustrates the fact that each large manufacturing operation supports countless numbers of people and their supplying companies.

Principal speaker of the evening was J. C. McDonald, assistant technical director of the Magnesium Division of Dow Chemical Co. Dr. McDonald's subject of "Magnesium Alloys and Their Applications" was presented in two main parts.

First he gave a metallurgical description of the various magnesium alloy systems, including the magnesium-aluminum alloys, the magnesium-zirconium alloys, and the newer combinations with the rare earths. Phase diagrams were presented for each system, as well as other physical and mechanical properties.

The latter part of the speaker's remarks consisted primarily of brief descriptions of certain existing magnesium applications, as well as some thoughts as to the future uses for the metal. The speaker also touched upon the role of the magnesium industries in national defense.

Cautions Against Misuse of Toolsteels



Principals at the November Meeting of the Texas Chapter Included (From Left): Charles Miller of Carpenter Steel Co.; Milton W. Phair, Secretary-Treasurer of the Chapter; H. C. Dill, Vice-Chairman; G. E. Brumbach of Carpenter Steel Co., Speaker; and Harold W. Schmid, Chairman

Reported by P. H. White
B. F. Coombs Co.

"Toolsteels: Their Use and Misuse" was the subject presented to the November meeting of the Texas Chapter by G. E. Brumbach, a metallurgical engineer engaged in development and customer contact work for the Carpenter Steel Co.

Showing slides of various dies which had failed in heat treatment and use, Mr. Brumbach directed particular attention to the cracks and fractures of certain typical sections developed in the quenching operation as a result of improper design. Mr. Brumbach pointed out some common design errors and the means of avoiding them. He stressed the importance of proper selection of toolsteels, careful consideration of quench stresses when designing, and rigidly controlled heat treating procedures.

The use of air hardening steels in intricate designs is an aid, but not a cure, the speaker cautioned, in eliminating failure of tools in quenching.

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	**Feb. 14**	University Club	**A. C. Gunsaulus**	Airplane Wheels and Brakes
Baltimore	**Feb. 19**	Plant Visitation		Aluminum and Magnesium
Boston	**Feb. 2**	Shelton Hotel	**W. E. Jominy**	National Officers' Night
British Columbia	**Feb. 8**	Medical-Dental Bldg. Vancouver	**Mr. Hendrick**	
Buffalo	**Feb. 8**		**Ralph Wilson**	Application of Alloy Steel
Calumet	**Feb. 13**	Phil Smidt & Son, Hammond, Ind.	**Walter Crafts**	Deoxidization of Steel
Chattanooga	**Feb. 13**	Maypole Restaurant	**C. L. Clark**	Alloys for High Temperature Use
Chicago	**Feb. 12**	Furniture Club		
Cincinnati	**Feb. 8**	Engineering Society	**Carl A. Zapffe**	
Cleveland	**Feb. 5**	Tudor Arms Hotel	**W. E. Jominy**	Alloy Steels from the Consumers' Standpoint
Columbus	**Feb. 9**	Fort Hayes Hotel	**M. Gensamer**	Steel Under Stress
Dayton	**Feb. 14**	Engineers Club	**R. D. Heidenreich**	Microscope and Electron Diffraction Results in Metallurgical Studies
Detroit	**Feb. 12**	Rackham Bldg.	**W. E. Jominy**	Reducing Wear by Proper Metallurgy
Eastern N. Y.	**Feb. 13**	Circle Inn	**Panel of Experts**	Titanium
Fort Wayne	**Feb. 12**	Chamber of Commerce	**J. H. Hollomon**	Physical Metallurgy
Hartford	**Feb. 13**	The Hedges	**Edward E. Hall**	Quality Control of Toolsteel
Indianapolis	**Feb. 19**	McClarney's Restaurant	**L. C. Hicks**	
Lehigh Valley	**Feb. 9**		**W. E. Jominy**	Tempering as Affected by Hardenability
Kansas City	**Feb. 21**	Fred Harvey Pine Room	**Elmer Gammeter**	National Officers' Night
Los Angeles	**Feb. 12**	Rodger Young Audit.	**J. O. Almen**	New Concepts on the Fatigue of Metals
Louisville	**Feb. 6**	Kapfhammer's Party House	**W. H. Johnson**	Foundry Practice of Gating
Mahoning Valley	**Feb. 13**	Post Room V.F.W.	**F. B. Foley**	Stainless Steel Today
Milwaukee	**Feb. 20**	City Club	**Howard Stagg**	Some Aspects of Toolsteels
Montreal	**Feb. 5**	Spanish Room Queen's Hotel	**R. B. Mears**	Chemistry of Corrosion
New Haven	**Feb. 15**	Colonial Inn, Hamden	**J. V. Bertrand**	Marform, the New Metal Drawing Process
New Jersey	**Feb. 19**	Essex House, Newark	**Panel Meeting**	What About Heat Treating?
New York	**Feb. 5**	2 Park Ave.	**S. G. Fletcher**	Toolsteels
North West	**Feb. 15**	Covered Wagon	**Peter Payson**	Annealing
North Texas	**Feb. 14**	Dallas		
Northern Ontario	**Feb. 21**	Windsor Hotel, Sault Ste. Marie	**Geo. McLeod**	Mining and Beneficiation of Iron Ores
Northwestern Pa.	**Feb. 15**	Meadville	**H. M. Webber**	Electric Furnace Brazing
Notre Dame	**Feb. 14**	Engineering Bldg. University of N. D.	**L. E. Gippert**	Toolsteels
Oak Ridge	**Feb. 14**	K. of C. Hall	**J. J. Kanter**	Engineering of High-Temperature Piping Systems
Ontario	**Feb. 2**	Royal Connaught Hotel, Hamilton	**Carl Zapffe**	Stainless Steels
Ottawa Valley	**Feb. 6**	Mines Branch	**Gordon E. Willey**	Steelmaking as Influenced by Specifications
Penn State	**Feb. 13**	217 Willard Hall		
Philadelphia	**Feb. 23**	Engineers Club	**R. L. Wilson**	Application of Alloy Steels
Pittsburgh	**Feb. 8**	Roosevelt Hotel	**Finn Jonassen**	An Outline of Research Activities Related to Welded Structures
Purdue	**Feb. 20**	Purdue Union		Symposium on NonDestructive Inspection
Rhode Island	**Feb. 7**		**H. E. Boyer**	Heat Treating Problems
Rochester	**Feb. 5**	Chamber of Commerce	**John V. Beall**	The Saga of South American Iron
Rockford	**Feb. 28**	Faust Hotel	**A. F. Holden**	Modernization and Use of Salt Bath Furnaces
Saginaw Valley	**Feb. 20**	Zehnder's, Frankenmuth	**H. B. Knowlton**	Selection of Materials
St. Louis	**Feb. 16**	Forest Park Hotel	**H. W. McQuaid**	New Economics of Steelmaking and Processing
Southern Tier	**Feb. 12**	Hotel Langwell, Elmira, N. Y.	**P. Payson**	Fundamentals of Heat Treatment
Springfield	**Feb. 19**	University of Massachusetts	**O. J. Horger**	Relationship of Metallurgy and Design
Terre Haute	**Feb. 5**			Stress and Strain Measuring
Texas	**Feb. 6**	Ben Milam Hotel, Houston	**M. A. Grossmann**	Alloying Elements and Grain Size in Steel
Toledo	**Feb. 15**	Maumee River Yacht Club	**Dr. Pabst**	Use of Statistics in Industrial Testing
Tri-City	**Feb. 6**	Rock Island Arsenal Cafeteria	**W. H. Holcroft**	The Carbonitriding Process for Case Hardening Steel
Tulsa	**Feb. 5**		**J. C. Holmberg**	
Utah	**Feb. 20**	Provo, Utah	**R. A. Schaus**	Factors Affecting Use of Stainless Steel

Warren	**Feb. 8**	**E. E. Thum**	Atomic Energy and Its Implications
Washington	**Feb. 12**	**M. A. Grossmann**	Burgess Memorial Lecture—Response to Heatment as Influenced by Alloys
West Michigan	**Feb. 19**	**T. Buchter**	Television
Wichita	**Feb. 20**	**Elmer Gammeter**	Manufacture of Steel Tubing
Worcester	**Feb. 14**	**W. M. Saunders, Jr.**	Casting Applications in Industry
York	**Feb. 14**	**C. W. Middlestead**	Metallurgy of Resistance Welding and Selection of Electrodes

Des Moines Chapter Tours Davenport Works of Alcoa

Reported by Kenneth G. Baldridge
Solar Aircraft Co.

A tour of the Davenport, Iowa, works of the Aluminum Co. of America constituted the program for the Nov. 14th meeting of the Des Moines Chapter A.S.M.

Visiting members and guests were shown a film strip and two movies as a preliminary to the tour. The films included a description of the electrolytic reduction of aluminum ore to pure aluminum, a brief review of research with aluminum, and a pictorial description of the unique use of aluminum in the construction of the plant.

After lunch the guests were conducted through the mill. The many departments inspected included the casting, charging, scalping, preheating, hot rolling, slab shearing, hot continuous rolling, annealing, cold strip rolling, end shearing, stretcher leveling, finish shearing, metal sawing, roller leveling and heat treating. The Davenport Works of Alcoa is devoted specifically to the production of sheet and plate aluminum alloys.

An interesting question and discussion period terminated the day's activities.

Hardenability Related to Mechanical Properties

Reported by P. Grimard
Foundry Superintendent, General Iron Works Co.

Factors in the relation of hardenability to composition were pointed out by M. J. Day, assistant metallurgical engineer, alloy steels, Carnegie-Illinois Steel Corp., addressing the Rocky Mountain Chapter A.S.M. in Denver on Oct. 20. Dr. Day spoke on "Hardenability and Its Relation to Mechanical Properties".

The fact that cooling is a critical factor in controlling structure was also noted. Hardness is closely related to cooling rate, other factors being equal. Carbon in relation to hardenability is probably the most important single factor. Alloys that contribute most to martensitic hardenability are Mo, Cr, and Mn. Correct tempering of martensite increased the toughness, Dr. Day mentioned.

The relationship of hardenability to residual stresses, distortion, quench cracking and microstructure was also illustrated in the lecture.

IMPORTANT MEETINGS *for February*

Feb. 15-17 — American Crystallographic Association. Meeting at National Bureau of Standards, Washington, D. C.

Feb. 19-22—American Institute of Mining and Metallurgical Engineers. Annual Meeting, Jefferson Hotel (Mining Branch) and Statler Hotel (Metals and Petroleum Branches), St. Louis Mo. (E. O. Kirkendall, secretary, Metals Branch, A.I.M.E., 29 West 39th St., New York 17.)

Feb. 28-Mar. 3 — Optical Society of America. Annual Meeting, National Bureau of Standards, Washington, D. C. (Prof. Arthur C. Hardy, secretary, c/o Massachusetts Institute of Technology, Cambridge 39, Mass.)

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio

W. W. Howell, Technical Abstractor

Assisted by Pauline Beinbrech, N. W. Baklanoff, Fred Rothfuss, and Leila M. Virtue

A GENERAL METALLURGICAL

316-A. Metalworking Research Reaches All-Time High. Charles N. Kimball. *Iron Age,* v. 166, Nov. 23, 1950, p. 68-70.

Third of series on research institutes. Facilities of Midwest Research Institute, Kansas City, Mo. Emphasis is on metallurgy. (A9)

317-A. Chile Now a Producer of Steel With Fully Integrated Plant. Frank Senior. *Blast Furnace and Steel Plant,* v. 38, Nov. 1950, p. 1285-1322, 1336.

Extensive details of all phases of this plant, including raw material compositions and sources; materials handling; coke ovens and by-product recovery; blast furnace and auxiliaries; pig casting; the bessemer converter; openhearth furnaces; ingot-mold foundry; blooming, billet, and sheet-bar mill; merchant mill; rolling mill; plate, sheet, and tinplate mills; annealing furnaces; boiler house; distribution of gas, water, electricity, air, oxygen, and acetylene; maintenance; stores; laboratories; etc.

(A5, D general, F general, ST)

318-A. A Practical Control Program of Health Hazards in a Metallurgical Research Laboratory. Willard H. Baumann. *American Industrial Hygiene Association Quarterly,* v. 11, Sept. 1950, p. 143-153.

The handling of toxic and radioactive materials in metallurgical research for atomic energy development. Facilities at Oak Ridge. Setting up an environmental control procedure for toxic dusts and fumes. (A7)

319-A. The Proposed New England Steel Plant. Clifford S. Strike. *Iron and Steel Engineer,* v. 27, Nov. 1950, p. 85-87.

(A4, ST)

320-A. Wanted—Huge Titanium Expansion. D. I. Brown. *Iron Age,* v. 166, Nov. 30, 1950, p. 87-88.

Present economic and technological status, including military desire for greatly expanded production and industry's reluctance to plunge.

(A4, Ti)

321-A. Japanese Mining and Petroleum Industries: Programs Under the Occupation. Robert Y. Grant. *Science,* v. 112, Nov. 17, 1950, p. 577-588.

Surveys metal and coal mining, metallurgical, and petroleum industries, also public agencies for these industries, in Japan. Includes list of reports available. (A4)

322-A. Wise Use of Waste Materials Results in Significant Savings. John D. Coleman. *Materials & Methods,* v. 32, Nov. 1950, p. 55-57.

Planned programs of General Motors plants for reclaiming waste stock from metalworking operations and for salvaging rejects and obsolete parts. (A8)

323-A. Latest Equipment in King-Seeley's New Plant. Joseph Geschelin. *Automotive Industries,* v. 103, Dec. 1, 1950, p. 40-41, 72-73.

Plant produces several lines of automotive and specialty equipment. It consists of a sizeable Zn die-casting department, a large electroplating department, a paint department, and facilities for assembly and machining. (A5, E13, L17, L26)

324-A. Today's Scrap—Availability, Condition and Contamination. Ralph W. Farley and Ray J. McCurdy. *Journal of Metals,* v. 188, Dec. 1950, p. 1435-1438.

As applied to electric-furnace steelmaking. (A8, D5, ST)

325-A. Metalworking Research Reaches All-Time High: Stanford Research Institute. Emo D. Porro. *Iron Age,* v. 166, Dec. 7, 1950, p. 124-126.

Just two years old, the Metals & Minerals Section of Stanford Research Institute has already launched 14 projects in metals and ceramics, most of them for relatively small companies. Facilities and organization. (A9)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

326-A. Heaters for Home and Industry. *Western Machinery and Steel World,* v. 41, Nov. 1950, p. 72-75.

Miscellaneous equipment and procedures of H. C. Little Burner Co., San Rafael, Calif., for production of oil-fired home and industrial heating units. Includes casting, press operations, welding, etc.

(A5, T27)

327-A. Vapor Degreasing Improves Cabinet Manufacture. Frank P. Cavenagh. *Western Machinery and Steel World,* v. 41, Nov. 1950, p. 77-79.

Use by Stor-All Corp., Inglewood, Calif. Also illustrates press operations, spot welding, etc. (A5, L12)

328-A. Integrated Processing Boosts Conduit Output. Dan Reebel. *Steel,* v. 127, Dec. 11, 1950, p. 94-98.

Continuous straight-flow operation at Mahoning Valley Steel Co., Niles, Ohio. Material traveling at rates of 125-200 ft. per min. is untouched by workers during slitting, seam-welding, forming, induction butt welding, cooling, sizing, shearing, straightening, chamfering and facing, electrogalvanizing, painting, drying, inspecting, and bundling.

(A5, ST)

329-A. Steel Is 1-A. E. C. K. Read. *Steelways,* v. 6, Nov. 1950, p. 1-4.

A few of the varied military and industrial uses of steel. Expansion programs underway and planned by various U. S. steel companies. Research under way.

(A4, T general, ST)

330-A. Aluminium Production; A Survey of World Capacity To-Day. L. Franzke. *Metal Industry,* v. 77, Nov. 17, 1950, p. 195-197; Nov. 24, 1950, p. 221-222. (Translated from *Chemische Industrie.)*

(A4, Al)

331-A. Making the Centurion Tank; Flow Line Production Methods at the Ministry of Supply Ordnance Factory, Barnbow, Leeds. *Machinery* (London), v. 77, Nov. 23, 1950, p. 507-520.

Miscellaneous equipment and procedures. Set-ups for machining and welding are emphasized.

(A5, K general, G17, T2, ST)

232-A. Producing Storage Battery Parts With Special Equipment. George E. Stringfellow. *Machinery* (American), v. 57, Dec. 1950, p. 172-178.

Cold-reducing hot rolled steel, continuous tube forming, perforating of steel strip with circular dies, broaching, welding, and producing flakes of pure nickel by an unusual process in which layers of Ni and Cu are alternately plated on steel cylinders.

(A5, G general, H10, T1, CN, Ni)

233-A. Progress in the British Iron and Steel Industry. *Metallurgia,* v. 42, Nov. 1950, p. 276-278.

A survey over the past two decades. (A4, Fe, ST)

234-A. Mineral Industries Research. *Pennsylvania State College, School of Mineral Industries,* Circular 36, 1950, 32 pages. (*Pennsylvania State College Bulletin,* v. 44, Sept. 29, 1950).

Research facilities of the school. Fields covered are earth sciences, including geography, geology, geophysics and geochemistry, meteorology, and mineralogy; mineral engineering, including mineral economics, mining, mineral preparation, and petroleum and natural-gas engineering; and mineral technology, including ceramics, fuel technology, and metallurgy. Includes a list of the school's publications.

(A9)

235-A. (Book) Theory and Practice of Industrial Research. David Bendel Hertz. 385 pages. 1950. McGraw-Hill Book Co., 330 42nd St., New York 18, N. Y. $5.50.

Covers the fundamental requirements of research operations and shows how the organization and structure which may be most profit-

ably utilized follow from an analysis of the elements in the process. Starts with the theoretical background and analytical material on creative mentalities, problem solving, and scientific method, applying these concepts to industrial research. Includes examination of cost and time elements, personnel selection and administration, facilities, patents, and internal and external relationships. (A9)

236-A. (Book) **International Tin Study Group Statistical Year Book, 1949.** 232 pages. 1950. International Tin Study Group, 7 Carel van Bylandtlaan, The Hague, Netherlands. $4.20.

Includes information on mine and smelter production, imports, and exports, tin concentrates and tin-containing goods, consumption, production and trade of the tin-plate and canning industries. (A4, Sn)

B

RAW MATERIALS AND ORE PREPARATION

333-B. Semisilica Refractories Lessen Furnace Structural Failures. G. Bickley Remmey. *Steel,* v. 127, Nov. 27, 1950, p. 62-64, 66, 68.

Semisilica brick, having high resistance to structural and thermal spalling and low resistance to plastic flow, are making excellent service records in kilns, soaking pits, forging furnaces, heating furnaces of all types, hot-metal mixers, open-hearth-furnace checker linings and fantails, and blast-furnace stoves. (B19)

334-B. The Treatment of Gold Ores in South Africa and Canada. E. C. Ellwood. *Bulletin of the Institution of Mining and Metallurgy,* Nov. 1950; *Transactions,* v. 60, pt. 2, 1950-51, p. 21-36.

Present practice with particular reference to the Witwatersrand. Some of the more controversial practices—such as hand sorting, milling in water rather than in barren cyanide solution, and use of pebble mills. On the Witwatersrand hand sorting is an economical practice, using native labor, but where labor costs are high this would not be the case. Use of pebbles for grinding might be considered in the Canadian gold fields. The relationship between comminution in the grinding and milling circuits with reference to the tendency on the one hand to use very fine crushing and, on the other, to use rod-mills for coarse grinding in the mill circuit. (B13, Au)

335-B. An Investigation Into the Action of Air in Froth Flotation. Jan Dzienisiewicz and E. J. Pryor. *Bulletin of the Institution of Mining and Metallurgy,* Nov. 1950; *Transactions,* v. 60, pt. 2, 1950-51, p. 47-52.

Authors' reply to discussion of a paper published in Apr. issue. See item 301-B, 1950. (B14)

336-B. Development of the Sludge-Sedimendation Process and Its Significance in the Dressing of Iron Ore. (In German.) Ernst Bierbrauer. *Archiv für das Eisenhüttenwesen,* v. 21, Sept.-Oct. 1950, p. 273-282.

Theoretical principles and industrial development of the process. Shows that it is a simple and efficient large-scale method for separating coarse-grained ores (up to 150 mm.) into concentrates, middlings, and tailings. Includes flowsheet, tables, and graphs. (B14, Fe)

337-B. Flotation and Cyanidation Tests on a Gold-Copper Sulfide Ore From Cooke, Montana. A. L. Engel and H. J. Heinen. *Mines Magazine,* v. 40, Sept. 1950, p. 28, 40; Nov. 1950, p. 24-26.

Previously abstracted from *U. S. Bureau of Mines,* Report of Investigations 4670. See item 175-B, 1950. (B14, Ag, Au, Cu)

338-B. Discussion—Extractive Metallurgy Division. *Journal of Metals,* v. 188, Nov. 1950; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, 1950, p. 1382-1388.

Covers the following papers: "The Electrical Resistivity of Titanium Slags", J. L. Wyatt (Aug. 1950); "The Relationship Between Electrical Conductivity and Composition of Molten Lead Silicate Slags", A. K. Schellinger and R. P. Olsen (Dec. 1949); "Thermodynamic Relationships in Chlorine Metallurgy", H. H. Kellogg (June 1950); "Fundamental and Practical Factors in Ammonia Leaching of Nickel and Cobalt Ores", M. H. Caron (Jan. 1950); and "Separation of Nickel and Cobalt", M. H. Caron (Jan. 1950).

(B general, C general, EG-a)

339-B. Studies of Recovery Processes for Western Uranium Bearing Ores. VI. Precipitation of Vanadium Red Cake. F. G. Seeley and C. F. Coleman. *U. S. Atomic Energy Commission,* AECD-2867, Oct. 20, 1949, 20 pages.

Results of an empirical study of precipitation from carbonate solutions. Best precipitation was obtained at pH 2.0-2.5. The rate was increased by increase of initial V, NaCl, or SO_4 concentration. (B13, U)

340-B. Mining and Milling Methods at the Caselton Mine, Combined Metals Reduction Co., Pioche, Lincoln County, Nev. George H. Holmes, Jr. *U. S. Bureau of Mines,* Information Circular 7586, Nov. 1950, 24 pages.

Crushing plant, milling practices, filter plant, and assay office. Metals obtained are Pb and Zn. (B13, B14, Pb, Zn)

341-B. Notes on Ball and Rod Mill Liner Practice in the Noranda Organization. *Canadian Mining and Metallurgical Bulletin,* v. 43, Nov. 1950, p. 621-634; discussion, p. 634-635; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 53, 1950, p. 435-448; discussion, p. 448-449.

Typical liner-performance data for various grinding mills at the Noranda, Waite-Amulet, Pamour, and Hallnor mines. A comparison of these data, based on wear per sq. ft. of lined millshell area. Compares wear performance of various alloy liner materials. (B13, Q9)

342-B. Progress in Iron Ore Beneficiation. Grover J. Holt. *Canadian Mining and Metallurgical Bulletin,* v. 43, Nov. 1950, p. 636-638; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 53, 1950, p. 450-452. (B 14, Fe)

343-B. The Relation Between Refractory Life and Refractoriness. W. J. Rees. *Iron and Steel Research Association,* "Conference on Cupola and Converter Refractories", 1949, p. 5; discussion, p. 13-14.

Defines refractoriness. Various factors which affect refractory life; test methods. (B19)

344-B. Preliminary Results of Ore Beneficiation of Ore From the Damme Mine. (In German.) Georg Sengfelder. *Stahl und Eisen,* v. 70, Oct. 26, 1950, p. 957-958.

Procedure developed for the above iron ore (22-23% Fe), clarified by flow diagrams. Compositions of raw ore and concentrates are tabulated. (B14, Fe)

345-B. Centrifugal Separation of Alloys. (In German.) Walter Roth. *Zeitschrift Für Erzbergbau und Metallhüttenwesen,* v. 3, Oct. 1950, p. 328-334.

Both theoretical and experimental investigations promise little practical success for segregation of alloy components by centrifuging the molten metal. However, the separation of primary crystals from the remainder of the melt by this method is more promising. It was found that shape and size of the crystals as well as viscosity of the melt affect the separation process. (B14)

346-B. New Process May Make Low-Grade Tin Ore Profitable. Colin G. Fink and Howard J. Strauss. *Engineering and Mining Journal,* v. 151, Dec. 1950, p. 96-97.

Experiments in partial reduction (SnO_2 to SnO) in a controlled atmosphere before leaching which indicate possibility of profitable use of low-grade tin ores and concentrates. A CO-CO_2 system was used. Partial reduction is preferred for several reasons. (B14, Sn)

347-B. Calculate Classifier Data Accurately by New Method. Fred C. Bond. *Engineering and Mining Journal,* v. 151, Dec. 1950, p. 90-91.

Circulating loads and efficiencies are best determined by actual measurement. However, next best is the method based on particle sizes determined from size-distribution curves. Illustrated by a typical example calculated both ways. (B13)

348-B. Twenty-One Years Progress in Refractories. J. H. Chesters. *Metallurgia,* v. 42, Nov. 1950, p. 293-296.

A review. (B19)

349-B. Ionic Theory of Slag-Metal Equilibria: Part I. Derivation of the Fundamental Relationships. P. Herasymenko and G. E. Speight. *Journal of the Iron and Steel Institute,* v. 166, Nov. 1950, p. 169-183.

Equilibrium positions of the principal ferrous slag-metal reactions are derived from the laboratory investigations of Chipman, Quarrell, Oelsen, and coworkers, assuming an ionic structure for slags. Advantage of this theory is shown to be that the number of slag constituents sufficient to describe the physicochemical behaviour of basic slags is considerably smaller than in theories assuming the presence of oxide molecules and their compounds. 32 ref.

(B21, D general, Fe)

350-B. Flotation. Strathmore R. B. Cooke. "Advances in Colloid Science, Vol. III", Interscience Publishers, New York, 1950, p. 321-374.

Colloid production in grinding and flotation reagents, including frothers, collectors, activators, and depressants. 78 ref. (B14)

C

NONFERROUS EXTRACTION AND REFINING

161-C. New Electrolytic Process Produces High Purity Chromium. *Steel,* v. 127, Dec. 4, 1950, p. 92-94.

See abstract of "Improvements in the Electrowinning of Chromium", R. R. Lloyd, J. B. Rosenbaum, V. E. Homme, L. P. Davis, and C. C. Merrill, *Journal of the Electrochemical Society;* item 82-C, 1950. (C23, Cr)

162-C. Production of Malleable Zirconium on a Pilot-Plant Scale. W. J. Kroll, W. W. Stephens, and H. P. Holmes. *Journal of Metals,* v. 188,

Dec. 1950; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, 1950, p. 1445-1453.

A pilot plant producing 600 lb. of Zr sponge per week comprises an arc furnace to make zirconium carbide, a chlorinator producing raw chloride, a purification vessel to eliminate zirconium oxide and iron from this chloride, two reduction vessels, two vacuum retorts for salt separation, and a graphite-resistor vacuum furnace to melt ingots. Plant layout, power consumption, operation schedules, and production costs. (C21, C25, Zr)

163-C. A Device for Maintaining a Constant Potential for Electrochemical Work. F. W. Chambers. *Journal of Scientific Instruments,* v. 27, Nov. 1950, p. 292-294.

A relatively simple and inexpensive apparatus, which can be used to control accurately the potential of either working electrode during a number of electrolytic operations, such as cathode potential during fractional electrodeposition of metals from their mixed solutions. A circuit for the simultaneous control of several cells is indicated. 15 ref. (C23, L17)

164-C. Extraction of Germanium From Sphalerite Collected From Nepal. Part I. R. K. Dutta and S. N. Bose. *Journal of Scientific & Industrial Research,* v. 9B, Oct. 1950, p. 251-252.

A laboratory method for extraction of Fe from the magnetic fraction of sphalerite. This fraction contains 0.24% Ge. The ore is roasted to convert sulfide to sulfate and oxide. HCl is added and $GeCl_4$ is distilled off. (C22, B15, Ge)

165-C. The Fe-Sb-S Ternary System and Its Importance in the Production of Antimony by the Precipitation Method. (In German.) W. Lange and H. Schlegel. *Chemische Technik,* v. 2, Aug. 1950, p. 258-261.

Because of unsatisfactory results obtained from reduction of Sb_2S_3 with Fe, experiments were made in which Na_2SO_4, Na_2S, Na_2O, NaCl, or Na_2CO_3 were added. Best results were obtained when the reduction was performed in several steps using Na_2CO_3 and an excess of Sb_2S_3. 92-95% Sb of 99.8% purity was obtained. Constitution diagrams and graphs. (C26, M24, Sb)

166-C. Principles of the Electrothermal Production of Ferrotungsten. (In German.) Hermann Härter. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 3, Oct. 1950, p. 325-328.

Metallurgical and electrical methods for producing ferrotungsten containing 80% W. Special attention is paid to the selection of the best type of carbon and the optimum voltage. (C21, Fe-n, W)

167-C. Metallurgical Investigation of the Reduction of Mixed Oxides of Cobalt and of the Refining of Unrefined Cobalt. (In German.) Willy Hilgers. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 3, Oct. 1950, p. 334-341.

Experimentally established optimum conditions and procedures for production of unrefined cobalt from an ore consisting of mixed oxides of Co, Mn, and Fe. When refining the Co, very little slag formation by Co was caused by removal of Mn. On the other hand, removal of Fe causes extensive slag formation. 17 ref. (C21, Co)

168-C. The Metallurgy of Metallothermic Melting. (In German.) Wilhelm Dautzenberg. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 3, Oct. 1950, p. 341-347.

History and principles of the thermit melting process. Differences between this process and reduction by carbon. Heats of reaction in aluminothermic and ferrothermic reactions, as well as in endothermic secondary reactions. Industrial application of these methods. (C26)

169-C. Reduction and Dissociation of the Oxides of Cobalt and Nickel. (In Russian.) G. I. Chufarov, M. G. Zhuravleva, and E. P. Tatievskaya. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 73, Aug. 21, 1950, p. 1209-1212.

Results of laboratory investigation. Reduction was studied at 200, 250, 300, and 350° C. in hydrogen atmospheres at 100, 200, 300, and 400 mm. Hg. Purity of the oxides was 98-99%. 11 ref. (C21, U2, Co, Ni)

170-C. Refining of Magnesium by Vaporization at Extremely Low Pressure. R. R. Rogers and G. E. Viens. *Journal of the Electrochemical Society,* v. 97, Dec. 1950, p. 419-424.

Experiments indicate that Mg alloy scrap may be refined by vaporization of the Mg at pressures less than 0.05 micron. The refined metal contains no Mn and only traces of Al, Si, Cu, and Fe. The Zn is vaporized also, but the Zn content of the refined Mg is substantially lower than that of the original charge. (C22, Mg)

171-C. The Relative Reliability of Aluminum and Zinc Starting Sheets for the Electrodeposition of Zinc. Glen C. Ware and Kenneth B. Higbie. *Journal of the Electrochemical Society,* v. 97, Dec. 1950, p. 425-429.

Zn sheet from three different sources, and Al sheet, were compared. The Al sheet was used with edge strips, as required by present commercial practice, and without edge strips. The materials were tested in electrolytes with a wide range of impurity contents. Average residence period was used as the measure of reliability. (C23, Zn, Al)

172-C. Influence of Additions During Electrolytic Production of Zinc From Sulfate Solutions. (In Russian.) A. G. Pecherskaya and V. V. Stender. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 23, Sept. 1950, p. 920-935.

Experimental investigation showed that additions of ions of alkaline and alkaline-earth metals are detrimental because they decrease the electroconductivity of the solution and hinder diffusion of Zn ions to the cathode. Detrimental influences of additions of Mn, Ni, Co, Cu, As, and Ge ions are also explained. Results of increasing cathode current density and of "poisoning" the surface of the Zn cathode were investigated. 23 ref. (C23, Zn)

D

FERROUS REDUCTION AND REFINING

318-D. How To Prevent Blast Furnace Lining Disintegration. J. A. Shea. *Steel,* v. 127, Nov. 27, 1950, p. 74, 77-78.

Treating brickwork with sulfur and with chloride by soaking, dipping, spraying, or adding the chemical to the bonding material is shown to afford adequate protection against CO attack on refractories. (D1)

319-D. A Progress Report on Carbon in Blast Furnace. T. J. Ess. *Iron and Steel Engineer,* v. 27, Nov. 1950, p. 68-75.

Review of progress indicates that the next few years will give a positive answer concerning the merits of carbon as a blast furnace refractory. (D1)

320-D. The Oxygen Content of Soft-Iron Melts and Solubility of Oxygen in Solid Iron. (In German.) Wilhelm Anton Fischer and Hans vom Ende. *Archiv für das Eisenhüttenwesen,* v. 21, Sept.-Oct. 1950, p. 297-304; discussion, p. 304.

Melts in a high-frequency furnace with slags saturated with FeO and SiO_2 proved the validity of Nernst's theory of the distribution of O_2 between molten metal and slag. Deviation occurred only when melting in a lime crucible caused the slag to be saturated with lime. Melts made under different types of slag, including some prepared under vacuum, showed that the solubility of O_2 in solid iron is 0.05-0.06%. 11 ref. (D6, Fe)

321-D. Discussion—Iron and Steel Division; New York Meeting, February 1950. *Journal of Metals,* v. 188, Nov. 1950; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, 1950, p. 1333-1352.

Covers the following papers: "The Tin-Fusion Method for the Determination of Hydrogen in Steel", D. J. Carney, J. Chipman, and N. J. Grant (Feb. 1950); "The Sampling and Analysis of Liquid Steel for Hydrogen", D. J. Carney, J. Chipman, and N. J. Grant (Feb. 1950); "The Mechanism of Sulphur Transfer Between Carbon-Saturated Iron and CaO-SiO_2-Al_2O_3 Slags", G. Derge, W. O. Philbrook, and K. M. Goldman (Sept. 1950); "Evaluation of pH Measurements With Regard to the Basicity of Metallurgical Slag", C. W. Sherman and N. J. Grant (Nov. 1949); "The Manganese Equilibrium Under Simple Oxide Slags", J. Chipman, J. B. Gero, and T. B. Winkler (Feb. 1950). "Equilibrium in the Reaction of Hydrogen With Oxygen in Liquid Iron", M. N. Dastur and J. Chipman (Aug. 1949). "Optical Temperature Scale and Emissivity of Liquid Iron", M. N. Dastur and N. A. Gokcen (Oct. 1949); "The Solubility of Oxygen in Liquid Iron Containing Aluminum", D. C Hilty and W. Crafts (Feb. 1950); "Solubility of Oxygen in Liquid Iron Containing Silicon and Manganese", D. C. Hilty and W. Crafts (Feb. 1950); "Thermodynamic Properties of Sulphur in Molten Iron-Sulphur Alloys", C. W. Sherman, H. I. Elvander, and J. Chipman (Feb. 1950); "The Effect of Carbon on the Activity of Sulphur in Liquid Iron", J. P. Morris and R. C. Buehl (Feb 1950); "Side-Blow Converter Process for the Production of Low Nitrogen Steel Ingots", R. R. Webster and H. T. Clark (May 1950); and "Experimental Operation of a Basic-Lined Surface-Blown Hearth for Steel Production", C. E. Sims and F. L. Toy (Apr. 1950). (D general, P12, S11, Fe, ST)

322-D. Faster Cooling Key to Jacquet Continuous Casting Method. *Steel,* v. 127, Dec. 4, 1950, p. 108, 110, 113.

Jacquet method, which uses multiple horizontal molds in casting steel. The arrangement protects the molten steel against oxidation before solidification. Rapid cooling of ingots gives uniform crystalline structure and limits segregation. (D9, ST)

323-D. Basic Open Hearth Operation. *Industrial Heating,* v. 17, Nov. 1950, p. 1974, 1976, 1978, 1980.

Summarizes seven papers presented at 2nd Basic Open Hearth Operating Session held during the 33rd Conference of the National Open Hearth Steel Committee, AIME. Cincinnati, Ohio. They cover charging

practice, stool stickers, mold coatings, nozzle setting, and furnace design. (D2, ST)

324-D. Recent Developments in Steel Plant Refractories and Masonry Aimed Toward Economy and Efficiency. *Industrial Heating,* v. 17, Sept. 1950, p. 1602, 1604, 1606, 1608; Nov. 1950, p. 2014, 2016, 2018, 2020-2021.

Summarizes papers presented at session on Refractories and Masonry of 33rd Conference of the National Open Hearth Steel Committee of the AIME. (D2, ST)

325-D. Practical Aspects of Tool Steel Melting. Charles F. Sawyer, Jr. *Journal of Metals,* v. 188, Dec. 1950, p. 1433-1434.

Basic electric arc melting and refining of toolsteels at Vanadium-Alloys Steel Co., Latrobe, Pa. (D5, ST)

326-D. Deoxidizing in the Ladle With Carbortam. W. O. Ingelman and D. A. Finch. *Journal of Metals,* v. 188, Dec. 1950, p. 1439-1441.

Experiences at National Malleable & Steel Castings Co. Cost savings and improved product quality resulting from use of "Carbortam" and CaSi as acid electric furnace deoxidizers instead of Al+CaSi. (Composition of "Carbortam" is not indicated.) (D5, B22, ST)

327-D. Control of Refractory Materials. C. E. Sumpter. *Journal of Metals,* v. 188, Dec. 1950, p. 1442-1443.

Materials used in the various parts of electric furnaces, methods of checking and controlling the quality of the materials, and results of trials completed recently at South Works, Carnegie-Illinois Steel Corp. (D5, ST)

328-D. The Performance of Various Monolithic Converter Refractories. J. L. Harrison. *Iron and Steel Research Association,* "Conference on Cupola and Converter Refractories", 1949, p. 6-7; discussion, p. 13-14.

Tests made on six linings under the same operating conditions. (D3, ST)

329-D. Laboratory Investigations of Used Monolithic Converter Materials. P. Murray. *Iron and Steel Research Association,* "Conference on Cupola and Converter Refractories", 1949, p. 8-12; discussion, p. 13-14.

Results of comparing used converter linings (used in tests described in the preceding paper by Harrison, item 328-D) and the unused original materials. (D3, ST)

330-D. Experience With Basic Bessemer Refractories. D. Bird. *Iron and Steel Research Association,* "Conference on Cupola and Converter Refractories", 1949, p. 15; discussion, p. 19-20.

Types of linings that have been used at Stewarts and Lloyds, Corby, England, in their five 25-ton converters. Results obtained. (D3, ST)

331-D. Refractory Wear and Converter Design. M. P. Newby. *Iron and Steel Research Association,* "Conference on Cupola and Converter Refractories", 1949, p. 16-18; discussion, p. 19-20.

The aerodynamic aspects. (D3, ST).

332-D. The Relining and Patching of Converters & Cupolas. H. Parnham. *Iron and Steel Research Association,* "Conference on Cupola and Converter Refractories", 1949, p. 42-43; discussion, p. 50-51.

Emphasizes use of monolithic refractories for the acid converter and the cupola. (D3, E10, ST)

333-D. Future Trends in Cupola and Converter Operation. A. H. B. Cross. *Iron and Steel Research Association,* "Conference on Cupola and Converter Refractories", 1949, p. 48-49; discussion, p. 50-51.

Future trends in refractory problems as indicated by the papers delivered. (D3, E10, ST)

334-D. Blowing Basic Bessemer Converters With Oxygen-Enriched Air; Experiences of the Eisenwerk-Gesellschaft Maxmilianshütte, Sulzbach-Rosenberg (Hütte). (In German.) Bruno Richthof. *Stahl und Eisen,* v. 70, Oct. 26, 1950, p. 959-961.

Results from a 20-year-old steel mill show large time, cost, and raw material savings for oxygen enrichment—more than ample to pay for increased costs. (D3, B22, ST)

335-D. Production of Low-Nitrogen Basic Bessemer Steel by Use of Oxygen-Enriched Blast. (In German.) Theo Kotz and Willy Oelsen. *Stahl und Eisen,* v. 70, Oct. 26, 1950, p. 961-962.

Results of five series of experiments made to determine how far the N_2 content in refined steel can be reduced. Low-phosphorus pig iron as well as the oxygen-enriched blast have a N_2-reducing effect. (D3, B22, ST)

336-D. Present Status of Efficiency of the Production of Steam and Electricity in Steel Plants. Energy Balances of 14 Large Steel Plants Over a Two-Month Period, During Each of the Years 1948 and 1949. (In German.) Kurt E. Poppe. *Stahl und Eisen,* v. 70, Oct. 26, 1950, p. 966-977. (D general, ST)

337-D. Introduction in Donawitz of the Double Blast Heater Without Use of Special Refractories. (In German.) Alois Vacek. *Stahl und Eisen,* v. 70, Oct. 26, 1950, p. 1014-1015.

Design of a highly efficient two-zone blast heater operated with highly purified blast-furnace throat gases. (D1, ST)

338-D Refining Basic Pig Iron With the Oxygen-Enriched Blast. (In German.) Hubert Hoff. *Stahl und Eisen,* v. 70, Oct. 26, 1950, p. 1015-1017.

Summarizes report presented to the Congres National de Recherche Metallurgique in June 1949. (D3, B22, ST)

339-D. Open Hearth Charging Time Cut 55%. L. R. Rissler. *Steel,* v. 127, Dec. 18, 1950, p. 114, 117, 120.

At Armco's new Middletown open-hearth department, 45,000-lb. loads of scrap and other charging materials are mechanically raised from ground to charging level in 25 sec. This first-of-its-kind materials handling set-up cuts furnace charging time and directly increases steel production. (D2, A5, ST)

340-D. Joint Discussion on the Papers—"Open-Hearth Furnace Models", by J. H. Chesters, A. R. Philip, R. S. Howes, and I. M. D. Halliday; "Experiments on Gaseous Mixing in Open-Hearth Furnace Models", by R. D. Collins and Miss J. D. Tyler; and "Experiments on the Gas and Fluid Flow in a Side-Blown Converter Model", by M. P. Newby. *Journal of the Iron and Steel Institute,* v. 166, Nov. 1950, p. 186-193.

Above papers were published in the Aug. 1949 issue. Includes authors' replies. (D2, D3, ST)

341-D. Experiments on Gaseous Mixing in Open-Hearth Furnace Models. Part II. Semi-Venturi Designs. R. D. Collins and J. D. Tyler. *Journal of the Iron and Steel Institute,* v. 166, Nov. 1950, p. 235-245.

The technique of using models to determine degree of mixing, described in Part I, is applied to a series of modified semi-Venturi designs. The most significant factors are size of gas port, slope of gas port, length of gas port, distance of throat from gas port, and sharpness of throat and knuckle contraction. These affect not only degree of mixing but also shape of the mixing pattern. A provisional theory of mixing is developed. (D2, ST)

342-D. (Book) Gas Producers and Blast Furnaces; Theory and Methods of Calculation. Wilhelm Gumz. 316 pages. 1950. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $7.00.

Development of theory and calculation methods, which can save large amounts of time and money in development of new types of gas producers and blast furnaces by reducing experimental work to a minimum. A general theory applicable to gas production in rotating-grate and slagging ash producers, to cupolas, and to blast furnaces, is presented. Part I is devoted to gas producers; Part II to blast furnaces and cupolas; and Part III to reaction kinetics. Thermodynamic data are tabulated in an appendix. Numerical examples are given. (D1)

343-D. (Book) Conference on Cupola and Converter Refractories. 1949. 52 pages, *British Iron and Steel Research Association,* 11, Park Lane, London, W. I., England.

Contains 14 papers (13 abstracted separately) on performance, design, and developments. (D3, E10, ST)

E

FOUNDRY

559-E. Pneumatic Tools — Foundry Uses. *American Foundryman,* v. 18, Nov. 1950, p. 28-30.

Grinders, chipping hammers; scaling hammers; sand rammers; hoists. (E24, G18)

560-E. Fume Control—Electric Melting Furnaces. J. M. Kane and R. V. Sloan. *American Foundryman,* v. 18, Nov. 1950, p. 33-35.

Emission of solids of the order of 5-8 lb. per hr. per ton of metal melted can be expected from electric melting furnaces in steel foundries. Particle sizes of solids, primarily FeO and Fe_2O_3 with some silica, are 95% less than 0.5 micron. Reduction of quantity of solids by about 75% can be obtained with good wet dust-collection equipment. (E10, A7, CI)

561-E. Demonstrate Shell Molding Process at Foundry Exhibit. *American Foundryman,* v. 18, Nov. 1950, p. 38-41.

New process for producing foundry molds and cores said to combine the advantages of increased production, reduced cost, and improved quality of the casting. The method, developed by Johannes Croning of Hamburg, Germany, employs a thermosetting plastic as a sand binder to produce a shell mold by application of the resin-sand mixture to a heated pattern. (E18)

562-E. Steel Casting in South Africa —Feeding Techniques. H. G. Goyns. *American Foundryman,* v. 18, Nov. 1950, p. 50-55.

Typical examples. (E23, CI)

563-E. Profits From Nodular Iron. B. Dixon. *Canadian Metals,* v. 13, Nov. 1950, p. 14-16, 43.

Practical experiences of Dominion Wheel & Foundries, Ltd., in producing superior castings of nodular iron. (E25, CI)

564-E. Special Equipment for Making Huge Die Cast Grille. *Automotive Industries,* v. 103, Dec. 1, 1950, p. 48, 76, 78.

Equipment and procedures for making Zn alloy Packard grille. (E13, T21, Zn)

565-E. Insulation Increases Riser Efficiency. W. H. Piper, Jr., and James O'Keefe, Jr. *Foundry,* v. 78, Dec. 1950, p. 72-75, 134, 137, 139.

Use of insulated risers by Erie

Bronze Co., in production of a wide variety of bronze castings typical of a jobbing foundry. (E22, Cu)

566-E. Permanent Mold Casting of Aluminum Engine Blocks. *Foundry,* v. 78, Dec. 1950, p. 84-85, 152, 154.

Procedures at Progress Pattern & Foundry Co., Saint Paul, Minn. (E12, Al)

567-E. Development and Evaluation of Cast Turbine Rotors. N. J. Grant, L. W. Kates, and N. E. Hamilton. *Foundry,* v. 78, Dec. 1950, p. 86-93, 234-239.

The practicability of casting gas turbine rotors, rather than forging them, has been demonstrated by investigations performed by MIT for the U. S. Navy's Bureau of Ships. Production methods and mechanical properties of the cast rotors. Alloy N-155 (30% Ni, 20% Cr, 20% Co, 3% Mo, 2.2% W, 1.3% Cb, 1.5% Mn, 0.15-0.30% C, and balance Fe) was chosen for the investigation. A wide range of grain sizes and shapes was obtained by use of mold materials of widely differing heat conductivity.
(E19, E25, Q general, SG-h)

568-E. Magnesium Alloys Containing Zirconium. George W. Orton. *Foundry,* v. 78, Dec. 1950, p. 95, 156, 158.

Methods for introducing Zr into Mg were investigated. The best results were achieved by use of Zr salts. Mechanical properties of the Mg-Zn-Zr alloys thus produced were found to be appreciably better than those of commercially available alloys. (E10, Q general, Mg)

569-E. Manufacture of Cast Steel Rolls. Samuel R. Robinson. *Foundry,* v. 78, Dec. 1950, p. 188, 190, 192.

Recommendations, including compositions for specific types and uses, melting and molding practice, annealing cycles, pouring temperatures, etc. (E11, J23, T5, CI)

570-E. Unique Insertion Process Cuts Pattern Making Costs. Franz Schumacher. *Tool & Die Journal,* v. 16, Dec. 1950, p. 72.

Process developed by Cooper Alloy Foundry Co. Lists eight major advantages. Plastic patterns are mounted on plates by use of inserts and low-melting alloy sealing. (E17)

571-E. Production of Complex Precision Die Castings Speeded With Less Rejects by Western Plant. Joseph L. Haver. *Western Metals,* v. 8, Nov. 1950, p. 21-23.

Equipment and procedures of Withrow Die Casting Co., Los Angeles. (E13)

572-E. Foundry Organization; Operations at a Repetition, Semi-Mass-Production Foundry. *Iron and Steel,* v. 23, Sept.-Nov. 1950, p. 369-372.

Practice at a British foundry. Shows how choice of most economical degree of mechanization for a given job is made after consideration of the various factors involved.
(E general, CI)

573-E. Possible Uses of Radioactive Isotopes in the Foundry. J. E. Johnston. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Oct. 1950, p. 523-529; discussion, p. 529-531.

Fundamentals and some applications which have already been made.
(E general, S19)

574-E. The Use of Low Phosphorus Cast Iron for Light Castings. A. N. Sumner. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Oct. 1950, p. 555-558; discussion, p. 558.

Experiences of a Scottish firm. Practice has been beneficial in every respect, particularly in connection with losses through breakage, either in subsequent processing or in transit. (E11, Q general, CI)

575-E. The Nodular Structures of Chilled Magnesium and Cerium Treated Irons After Heat Treatment. J. W. Grant. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Oct. 1950, p. 571-574.

Effects of different factors.
(E25, J general, CI)

576-E. Modern Cupola Design and Operation at Home and Abroad. W. J. Driscoll. *Iron and Steel Research Association,* "Conference on Cupola and Converter Refractories", 1949, p. 21-22.

Reviews recent trends in Europe and America. (E10, ST)

577-E. Cupola Refractories—A Review of the Literature. W. A. Archibald. *Iron and Steel Research Association,* "Conference on Cupola and Converter Refractories", 1949, p. 23-29; discussion, p. 30-31.

Covers location of wear, acid lining materials, acid patching materials, basic lining materials, cupola design and construction, operating conditions, lining life, and mechanism of slag attack. 71 ref.
(E10, ST)

578-E. Some French Developments in Cupola Linings. M. P. Nicolas. *Iron and Steel Research Association,* "Conference on Cupola and Converter Refractories", 1949, p. 32-33.

Improvements of the quality of ganister lining. Satisfactory application of the results to practice.
(E10, ST)

579-E. Refractories for Bessemer Steel Foundries in Germany. K. J. Ferdinand Klein. *Iron and Steel Research Association,* "Conference on Cupola and Converter Refractories", 1949, p. 34-35.

Developments in lining of melting units. (E10, D3, ST)

580-E. Water Cooled Cupolas. W. H. Bamford. *Iron and Steel Research Association,* "Conference on Cupola and Converter Refractories", 1949, p. 36-37.

Water-cooling procedure and its results in increasing cupola life to meet increased demands for steel castings. (E10, ST)

581-E. Developments in Foundry Refractories. G. R. Rigby. *Iron and Steel Research Association,* "Conference on Cupola and Converter Refractories, 1949, p. 39-41; discussion, p. 50-51.

Lines for future developments, particularly in rammed linings.
(E10, ST)

582-E. Melting, Deoxidizing, and Casting Heavy Nonferrous Metals. (In German.) Eugen Tofaute. *Neue Giesserei,* v. 37 (new ser., v. 3), Oct. 19, 1950, p. 466-469.

A general survey. Series of elements arranged according to their affinity for oxygen. Practical recommendations. (E10, EG-a)

583-E. Testing Casting Properties; A Practical Method for Assessing the "Local Shrinkage" Defect. E. Scheuer, S. Williams, and J. Wood. *Metal Industry,* v. 77, Dec. 1, 1950, p. 235-239.

New method indicates that the trouble is directly connected with differences in gas content of the metal. Principle of the method was to induce shrinkage in one area by creating an artificial "hot spot." Various methods of producing the "hot spot" by provision of an insulating material in the die face were tried, also various die designs. The work was done on Al alloys of various compositions. (E25, Al)

584-E. Steel Castings—Past, Present and Future. J. F. B. Jackson. *Metallurgia,* v. 42, Nov. 1950, p. 285-288.

Reviews progress of last 20 years in foundry practice and inspection.
(E11, S13, CI)

585-E. Twenty-One Years of Iron Foundry Progress. J. Blakiston. *Metallurgia,* v. 42, Nov. 1950, p. 344-346.

A review. (E general, Fe)

F PRIMARY MECHANICAL WORKING

272-F. Portable Ingot Stripper Offers Flexibility. *Iron Age,* v. 166, Nov. 23, 1950, p. 71.

250-ton stripper which can be suspended from a crane hook. It is in use at Rotary Electric Steel Co., Detroit. (F21)

273-F. Rolls and Rolling. Part XX. Channels. E. E. Brayshaw. *Blast Furnace and Steel Plant,* v. 38, Nov. 1950, p. 1323-1326, 1328-1329.

Roll-pass designs for different types of channels, when the bending method is used. (F23)

274-F. Arvida Mill Is Fully Automatic and Repeating. H. Jones. *Iron Age,* v. 166, Nov. 30, 1950, p. 72-75.

Aluminum Co. of Canada's new Belgium rod mill which combines the advantages of the free-looping mill with those of the continuous mill, at low initial investment. Automatic and simple operation enabled green crews to produce at higher than rated capacity in less than 6 months. (F27, Al)

275-F. Automatic Self-Centering Rolls and Pulleys. E. T. Lorig. *Iron and Steel Engineer,* v. 27, Nov. 1950, p. 57-67.

Tracking and aligning problems encountered in the processing of cold, wide, light-gage, flat, metal strip in continuous lines for pickling, cleaning, shearing, electrolytic tinning, continuous galvanizing, etc. Results of extensive study by Carnegie-Illinois Steel Corp. have led to development of self-centering rolls. Schematic diagrams show the effects of various roll contours on the tendency of the strip to get out of alignment. (F23, L12, L15, L17)

276-F. Chile Builds a New Merchant Mill. E. C. Peterson. *Iron and Steel Engineer,* v. 27, Nov. 1950, p. 88-92.
(F23, ST)

277-F. New Bar Production Facilities at Bethlehem's Lackawanna Plant. George A. Henderson. *Iron and Steel Engineer,* v. 27, Nov. 1950, p. 93-100.
(F23, ST)

278-F. One Man Bull-Block Developed for Cold Draw. *Iron and Steel Engineer,* v. 27, Nov. 1950, p. 136, 138.

New unit completely equipped for drawing ferrous and nonferrous tubes and rods. One of the unusual features is that the push pointer and shears are an integral part of the unit. (F26, F27)

279-F. The Use of Roller Bearings in High-Temperature Thin-Sheet Rolling Mills. (In German.) Wilhelm Krämer. *Stahl und Eisen,* v. 70, Oct. 12, 1950, p. 925-929.

Reasons for use and practical suggestions for design. (F23)

280-F. The Use of Resilient Pads on Forging Hammers. Francis A. Westbrook. *Steel Processing,* v. 36, Nov. 1950, p. 565-566, 586.

Use of pads to minimize damage to surroundings caused by impact shock and vibration. (F22)

281-F. Die Sinking for Drop Forging. (Concluded.) Part X. "Trimmer Dies". John Mueller. *Steel Processing,* v. 36, Nov. 1950, p. 567-569, 582-583.
(F22)

282-F. Tube Reducing Machine Has Novel Die Arrangement. *Product Engineering,* v. 21, Dec. 1950, p. 100-101.

Recently redesigned Rockrite tube reducing machine employs a unique

rocking-die principle to produce accurately sized tubing from less accurate hot-formed tube. The dies rock back and forth to knead the work over a specially formed mandrel. This kneading cold works the metal in compression and reduces it to a smaller diameter tube with much greater length. (F26)

283-F. Advantages of Cold-Drawn Pinions. Edbridge H. Rathbone. *Product Engineering,* v. 21, Dec. 1950, p. 114-116.

Three methods of making small pinions are by cutting the teeth, by extruding, and by cold drawing of rods into finished pinion rod. If the metal has good cold working properties, the last process produces pinions of the highest durability and load-carrying capacity, and to an accuracy equal or better than cut teeth. Comparative data on hardness gradient from center to surface are charted for AISI 1112, phosphor bronze, and brass. Comparative durability of cold drawn and cut pinions of the same metals. (F27, Q29, T7, AY, Cu)

284-F. French Building Two Continuous Hot Strip Mills. *Steel,* v. 127, Dec. 11, 1950, p. 110, 112.

Includes cold reduction, pickling, and annealing. (F23, J23, L12, ST)

285-F. Press Forging. *Automobile Engineer,* v. 40, Nov. 1950, p. 363-369.

Equipment and production methods employed by J. Garrington & Sons, Ltd., in Britain. (F22, ST)

286-F. The Forging of Metals; Its Effect on Their Physical Characteristics. J. Lomas. *Machinery Lloyd* (Overseas Edition), v. 22, Nov. 11, 1950, p. 84-89, 91, 93, 95. (F22)

287-F. Slab Pre-Heating Furnaces; New Installation at Rogerstone. *Metal Industry,* v. 77, Nov. 17, 1950, p. 199-200.

New plant of Northern Aluminum Co., Ltd., in Britain. The Al alloy slabs are electrically preheated prior to rolling. See also items 267-F and 268-F, and 288-F through 292-F, 1950. (F23, F21, Al)

288-F. Continuous Rolling Mill of the Northern Aluminium Company at Rogerstone. *Engineering,* v. 170, Sept. 29, 1950, p. 265-267; Oct. 6, 1950, p. 281-283; Nov. 10, 1950, p. 337-340.

See also items 267-F and 268-F and 287 through 292-F, 1950. (F23, Al)

289-F. Aluminium Strip Mill at Rogerstone. *Engineer,* v. 190, Sept. 29, 1950, p. 319-322; Oct. 6, 1950, p. 351-353; Nov. 17, 1950, p. 459-461; Nov. 24, 1950, p. 487-489.

See items 267 and 268-F, and 287 through 292-F. (F23, Al)

290-F. Continuous Strip Mill for Aluminium. *Machinery* (London), v. 77, Nov. 9, 1950, p. 449-453.

See also items 267 and 268-F, and 287 through 292-F. (F23, Al)

291-F. Rogerstone. *Light Metals,* v. 13, Sept.-Oct. 1950, p. 472-493.

See also items 267 and 268-F, and 287 through 292-F. (F23, Al)

292-F. The Commonwealth's Largest Aluminium Rolling Mill. Northern Aluminium's Venture at Rogerstone. *Mining Journal,* v. 235, Nov. 17, 1950, p. 479-481.

See also items 267 and 268-F, and 287 through 291-F. (F23, Al)

293-F. Relations Between Roll-Force, Torque, and the Applied Tensions in Strip-Rolling. Rodney Hill. *Institution of Mechanical Engineers, Proceedings* (Applied Mechanics Div.), v. 163, W.E.P. No. 58, 1950, p. 135-140; discussion, p. 144-148.

Expressions are derived for roll-force and torque in strip-rolling under tension, as functions of pressure distribution on the rolls and of radius of the deformed arc of contact. Conclusions are confirmed by experiments on annealed mild steel strip. Theory indicates also that roll-force decreases linearly with both front and back tensions. (F23)

294-F. A Theoretical Investigation of Roll Flattening. D. R. Bland. *Institution of Mechanical Engineers, Proceedings* (Applied Mechanics Div.), v. 163, W.E.P. No. 58, 1950, p. 141-144; discussion, p. 144-148.

A method of determining distortion of the roll surface when subject to a known pressure distribution. This method is then combined with a plastic-flow theory of rolling to determine the shape of the arc-of-contact and the pressure distribution over it when neither of these are known beforehand. Accuracy of the results is estimated to be 20%. (F23)

295-F. New Methods of Producing Fittings by Forging, Welding, and Machining. (In German.) K. Krekeler. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 92, Oct. 21, 1950, p. 833-836.

More efficient methods of manufacturing different types of valve parts, proposing the welding of individual sections by the submerged-melt process. (F22, G17, K1, T7, ST)

296-F. Drawing Tests With Alloy Steel Wires Under Different Working Conditions. (In German.) Werner Lueg and Anton Pomp. *Stahl und Eisen,* v. 70, Oct. 26, 1950, p. 977-984.

Tests show that a coating of common salt used as a lubricant carrier produces superior results. Three different steels drawn by different methods, at different rates, and with different degrees of cross-sectional reduction, were tested. (F28, F1, AY)

297-F. Pointing, Shearing Part of Continuous Cycle of New Bull Block. *Iron Age,* v. 166, Dec. 14, 1950, p. 114.

How the above contribute to high production in drawing copper tubing. (F26, Cu)

298-F. Lubricant Coatings on Wire for Bolt and Rivet Manufacture. W. E. Hill, Jr. *Wire and Wire Products,* v. 25, Dec. 1950, p. 1046, 1074-1078.

Present status of industrial practice. Characteristics and advantages of a universal lubricant. (F1, ST)

299-F. Chemically Applied Coatings for the Cold Drawing of Wire. James F. Leland. *Wire and Wire Products,* v. 25, Dec. 1950, p. 1049, 1082-1084.

Processes and solutions developed by Parker Rust Proof Co., Detroit, for mild and stainless steels. (F1, CN, SS)

300-F. Europe's Largest Continuous Strip Mill for Aluminium Opens at the Rogerstone Works of the Northern Aluminium Co. Ltd. *Sheet Metal Industries,* v. 27, Nov.-Dec. 1950, p. 893-900, 904.

See also items 267 and 268-F, and 287 through 292-F, 1950. (F23, Al)

301-F. The Rolling of Metals. Hugh Ford, *Sheet Metal Industries,* v. 27, Nov.-Dec. 1950, p. 901-904.

Discusses Vol. I of the recently published book by L. H. Underwood. (F23)

302-F. The Problem of Die Wear With Special Reference to the Performance of Sintered Carbide Dies. J. G. Wistreich. *Wire Industry,* v. 17, Nov. 1950, p. 889-892, 895-896; discussion, p. 896-897, 899.

Economic importance of this problem in the wire industry. Investigation of the nature of wear of the dies. (F28, Q9, C-n)

303-F. Progress in the Cold Working of Metals, 1929-1950. W. C. F. Hessenberg. *Metallurgia,* v. 42, Nov. 1950, p. 334-336.

A review. (F general, G general)

304-F. (Book) **The Rolling of Metals, Theory and Experiment.** Vol. 1. L. R. Underwood. 344 pages, 1950. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $6.50.

See item 171-F, published by Chapman & Hall, London. (F23)

G

SECONDARY MECHANICAL WORKING

367-G. Cutting Metal-Cutting Costs. *Modern Industry,* v. 20, Nov. 15, 1950, p. 38-43.

Ideas apply to other materials as well as metals. Includes numerous illustrations of unusual machine-tool equipment. (G17)

368-G. Portable Shear Handles 1-Inch Rod. Evans Jasper. *Iron Age,* v. 166, Nov. 23, 1950, p. 74-76.

Newly developed portable hydraulic unit capable of cutting rod up to 1⅛ in., cable up to 3½ in., wire rope up to 1¼ in., and chain up to 1 in. in diam. It has been found relatively simple to modify the units to perform specialized cutting, punching, swaging, riveting, and pressing operations for all types of industry, where portability, capacity, and compact size of the equipment is advantageous. (G15)

369-G. The Action of Cutting Fluids in Machinery. M. Eugene Merchant. *Iron and Steel Engineer,* v. 27, Nov. 1950, p. 101-107; discussion, p. 107-108.

See abstract of "Fundamentals of Cutting Fluid Action," *Lubrication Engineering,* item 238-G, 1950. (G21)

370-G. Magnesium Sheet Hot Formed at Less Cost. Gilbert C. Close. *Steel,* v. 127, Nov. 27, 1950, p. 56-58.

Tests at Douglas Aircraft show that staging operations in drop-hammer forming can be eliminated. Parts formerly formed in two parts and then welded can now be stretch formed in one piece. (G9, Mg)

371-G. Choose From 24 Cutoff Dies. J. R. Paquin. *American Machinist,* v. 94, Nov. 27, 1950, p. 96-98.

Diagrams show 24 types with brief description of applicability of each. (G2)

372-G. Die Life Test Cuts Cost of Laminations. A. T. Hamill. *American Machinist,* v. 94, Nov. 27, 1950, p. 100-102.

Results of controlled tests on lamination punches and dies which establish superiority of carbide over cast nonferrous alloys, and of carburized high speed steel over high-carbon, high-chromium types. Test procedure and apparatus. (G2, T5, C-n, SG-j, TS)

373-G. Air Force, Curtiss-Wright, Ford, Metcut Report Proves Machinability Depends on Microstructure. Rupert Le Grand. *American Machinist,* v. 94, Nov. 27, 1950, p. 109-124.

Summary of complete report on cooperative research project recently published by Curtiss-Wright Corp. The work done on irons and steels, plus additional data and its practical application by Ford to the manufacture of automobile parts at less cost. Includes comparisons of turning, drilling, and milling of cast iron, cast steel, and nodular iron. (G17, M27, CI, ST)

374-G. Magnesium Tubing Spun and Brazed to Produce Critical Part. Don C. Law. *Materials & Methods,* v. 32, Nov. 1950, p. 65-67.

Production of floats for hydraulic automobile lifts. Corrosion has caused occasional failures in the past. The floats are plated with Zn, Cu, and Cd. (G13, K8, T21, Mg)

375-G. Sheet Steel Into Office Equipment. H. N. Acker. *Canadian Metals*, v. 13, Nov. 1950, p. 24-26.

Equipment and procedures. Includes mechanized handling, shearing, punching, bending, forming, spot welding, phosphating, and spray painting.
(G general, K3, L14, L26, T10, CN)

376-G. The Aluminum Bearing, Non-Aging Steels and Their Cold Extrusion. H. Hauttman and H. J. Pessl. *Steel Processing*, v. 36, Nov. 1950, p. 557-564, 583.

Advantages of process developed in Germany during the last war. This material and time-saving forming method, far from being limited to Ordnance production, is rapidly extending its application into many new fields of steel fabrication. Mechanical-property requirements and behavior of steels to be cold extruded; principles of the process. Different applications of the method.
(G5, CN)

377-G. The Cold Working of the Stainless Steels. Part IV. Lester F. Spencer. *Steel Processing*, v. 36, Nov. 1950, p. 570-575, 587.

Choice of tool materials, lubricants, spinning, cold heading, press equipment, and drawing pressures. 23 ref. (G general, SS)

378-G. Uses of Oxy-Acetylene Processes in the Steel Fabricating Industry. Charles I Orr. *Steel Processing*, v. 36, Nov. 1950, p. 577-579, 586.

Miscellaneous uses in flame cutting, welding, heating, straightening, scarfing, etc.
(G22, K2, ST)

379-G. Super High-Speed Steels Set New Production Record. P. Leckie-Ewing. *Iron Age*, v. 166, Dec. 7, 1950, p. 115-118.

Greater wear than standard high speed steels and higher toughness than cast alloys and carbides are said to justify the extra cost of super high speed steels. Greatest efficiency is obtained at feeds about twice as great as with standard high speed tools. Hot hardness is 20-30% greater than for standard grades. All of these steels are characterized by a high alloy content, especially of Co and/or V, frequently coupled with a high carbon content.
(G17, Q9, Q29, TS)

380-G. Magnetic Tracing—A Flame Cutting Production Aid. H. G. Frommer. *Modern Machine Shop*, v. 23, Dec. 1950, p. 90-98, 100, 102, 104, 106, 108, 110, 112, 114.

Fundamentals of magnetic tracing and several practical applications.
(G22)

381-G. Progressive Dies Make Precision TV Parts. Rupert LeGrand. *American Machinist*, v. 94, Dec. 11, 1950, p. 133-136.

Two outstanding examples are stainless steel collars for the electron gun of the picture tube (stamped out in two halves and spot welded), and brass shield bases. Seven stations are used for the first and 15 stations for the latter part. Details of each step.
(G3, SS, T1, Cu)

382-G. Induction Heat + Versatile Fixture = Doubled Production. W. R. Yeakel. *American Machinist*, v. 94, Dec. 11, 1950, p. 164-165.

Special fixture easily adjustable for diameter and length which makes it possible to apply induction heating to heading of large bolts, cutting equipment requirements in half. (G10)

383-G. Polishing and Finishing True Temper Products. N. J. Benton. *Products Finishing*, v. 15, Dec. 1950, p. 66-68.

Mechanical finishing of shovels at Shelton Works, True Temper Corp., Dunkirk, N. Y. (G19, L10, CN)

384-G. Production Pointers for Machining Stainless Steels. *Production Engineering & Management*, v. 26, Dec. 1950, p. 53-57.

Many of the difficulties encountered in the machining of stainless steels can be avoided by following the recommendations given.
(G17, SS)

385-G. Fundamentals of the Working of Metals. Part XVII. Tension Type Working Processes. George Sachs. *Modern Industrial Press*, v. 12, Nov. 1950, p. 6, 8, 10.

Stretch forming, stretching, and stretch flanging. Tension failures, forming limits, dimensional changes, and buckling failures in stretching processes. (G9)

386-G. Time Studies Show Production Increases With Lead Bearing Screw Steel. Henry J. Holquist. *Tool & Die Journal*, v. 16, Dec. 1950, p. 54-56.

Typical studies in which "Ledloy" was compared with B-1113 with respect to machining time and speed.
(G17, CN, SG-k)

387-G. How Flat Can You Get? *Fortune*, v. 42, Dec. 1950, p. 115-118, 120, 122.

Equipment and procedures for production of flat, smooth surfaces of extreme precision. Need of the automotive industry for putting such surfaces on hydraulic-transmission castings has led to mechanization of the old lapping process. Development of Johansson gage blocks which were the first example of precision hand lapping. Other uses of the lapping process. (G19)

388-G. Want To Do Better Cutting? Phil Glanzer. *Welding Engineer*, v. 35, Dec. 1950, p. 40.

Suggestions for setting torch-cutting tips. (G22)

389-G. Development of High Speed Toolsteels. (In German.) Robert Scherer and Winfried Connert. *Stahl und Eisen*, v. 70, Oct. 26, 1950, p. 984-994.

A brief history followed by a comprehensive survey of research on suitable compositions and uses since 1938. Schrupp lathe tests were made to determine optimum amounts of alloying elements (with due regard to their availability). Effects of W, Mo, V, Co, Ti, Cr, C, and Al on cutting efficiency of the steels. Nitrides (especially Al nitrides) improved the cutting efficiency of the steels. 33 ref. (G17, T6, TS)

390-G. Accuracy in Machining—Its Standardization and Cost. Tom H. Vogel. *Tool Engineer*, Nov. 1950, p. 17-19; Dec. 1950, p. 28-31.

Previously abstracted from *Engineers' Digest*. See item 236-G, 1950.
(G17)

391-G. Contour Forming Speeds Bus Body Fabrication. *Steel*, v. 127, Dec. 18, 1950, p. 94-96.

Advanced manufacturing methods borrowed from the aircraft industry using combination of stretch forming and compression forming. Structural members formerly made in two or more sections and joined are now shaped in one piece, saving weight, fabrication and assembly time. (G1, Al, ST)

392-G. Grinding Fluids; A Method of Measuring the Metallic Wheel-Loading Characteristics. L. H. Sudholz, S. Manilych, and G. S. Mapes. *Mechanical Engineering*, v. 72, Dec. 1950, p. 963-965, 983.

Method for accurately recording and measuring metallic wheel loading involves chemical detection of metallic particles embedded on the surface of the grinding wheel. Another application is determination of the effectiveness of wheel dressing. Investigation of various fluids by this method. It appears that type of grinding fluid is one of the most critical factors in efficiency of grinding. (G18)

393-G. Production-Line Methods Employed in Building Elevators. W. G. Nutzel. *Machinery* (Aerican), v. 57, Dec. 1950, p. 148-154.

Production methods and new facilities employed at Otis Elevator Co. in manufacturing hollow metal doors and cabs for elevators. Materials used are stainless steel, bronze, Al, and hot and cold rolled steel sheets. Operations include press forming, stamping, shearing, arc welding, and finishing.
(G1, G3, G15, K1, L general, T26, SS, Cu, Al, ST)

394-G. Carbide Burs Simplify Difficult Machining Operations. George H. DeGroat. *Machinery (American)*, v. 57, Dec. 1950, p. 155-158.

How hardened dies and molds are quickly altered without annealing, inaccessible corners and recesses are easily machined, and many other machining problems are solved by making use of carbide burs. Various types and their applications. (G17)

395-G. (Book) **Increased Production, Reduced Costs Through a Better Understanding of the Machining Process and Control of Materials, Tools, Machines.** 162 pages. 1950. Curtiss-Wright Corp., Wood-Ridge, N. J.

Procedures for metal-cutting research. Carbide-tool selection and evaluation of machine tools for better productivity. Presents heretofore unpublished data on the best ways to machine high-temperature alloys, cast iron and steels in the light of their microstructures.
(G17, M27, SG-h, ST, CI)

H

POWDER METALLURGY

98-H. Powder Metallurgy. Paul Schwarzkopf. *Journal of the American Society of Naval Engineers*, v. 62, Nov. 1950, p. 909-919.

Reprinted from *Mechanical Engineering*. See item 59-H, 1950.
(H general)

99-H. Beryllium Powder Compacts Reduced 9% by Cold Rolling. *Steel*, v. 127, Dec. 11, 1950, p. 93. Based on "The Powder Metallurgy of Beryllium", Henry H. Hausner and Norman P. Pinto.

Previously abstracted from *American Society for Metals*, Preprint 38, 1950. See item 74-H, 1950.
(H14, H15, Be)

100-H. On the Pressing of Nickel Powder. H. Lipson. *Powder Metallurgy Bulletin*, v. 5, Sept. 1950, p. 52-57.

Pressing moduli of different sizes of Ni powder were determined for single and double-action dies. The moduli do not vary appreciably with particle size except when there is a marked difference in apparent density for a certain size of powder.
(H14, H11, Ni)

101-H. Application of Dilatometry to Powder Metallurgy. J. H. Andrew and G. S. Tendolkar. *Journal of Scientific & Industrial Research*, v. 9B, Oct. 1950, p. 244-247.

Modified horizontal dilatometer designed and used to study volume changes of pressed Cu-powder specimens during heating. Characteristics of the curves showing the relationship between linear expansion and temperature vary with particle size and compacting pressure.
(H14, Cu)

102-H. Powder Metallurgy Studies, I-II. (In German.) J. Heuberger. *Acta Polytechnica* (Chemistry Including

Metallurgy Series), v. 2, no. 3, 1950, 20 pages.

Part I: Sintering behavior of copper graphite powder compacts. Variation of apparent density and hardness of 90% Cu and 10% graphite was studied at sintering temperature. Compacts were produced by pressure of 270 to 2660 kg. per sq. cm., and investigated from 450 to 800° C. Part II: Compactability of iron powder. On the basis of assumptions founded on practical experience a logarithmic equation is deduced for the connection between specific pressure and apparent density of iron-powder compacts, which seems to be satisfactory for a number of these compacts investigated within a large pressure range.
(H11, H14, H15, Cu, Fe)

103-H. Effect of Plasticity of the Metal Particles on the Sintering of Metal Powders. (In German.) Franz Skaupy. *Zeitschrift für Metallkunde,* v. 41, Sept. 1950, p. 301-303.

Various theories compared with the results obtained during the sintering of high-melting oxides. 15 ref. (H15)

104-H. Rolling of Strips From Iron Powder. (In German.) Gerhard Naeser and Franz Zirm. *Stahl und Eisen,* v. 70, Oct. 26, 1950, p. 995-1004.

Conditions required to roll continuous strips of sheet metal from iron and other metal powders. Effects of production conditions (density of the rolled metal, grain size of the powder, sintering time and temperature, etc.) on tensile strength of the rolled strip. 29 ref. (H14, Fe)

105-H. Twenty-One Years of Powder Metallurgy. H. W. Greenwood. *Metallurgia,* v. 42, Nov. 1950, p. 336-338.

A review. 14 ref. (H general)

106-H. Relationship of Coercive Force of Powders of Highly-Coercive Alloys on Particle Size. (In Russian.) T. D. Zotov and Ya. S. Shur. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 74, Oct. 1, 1950, p. 687-689.

Studied for "Alni" alloy (25% Ni, 14% Al, rest Fe) differently produced and heat treated. Results indicate that this relationship is strongly influenced by method of production of the powders and by the conditions of heat treatment.
(H11, Fe)

J

HEAT TREATMENT

275-J. Good Carburizing Practice. III. Production of Carburizing and Carrier Gases. T. A. Frischman. *American Machinist,* v. 94, Nov. 27, 1950, p. 104-107.

Operation of gas generators and furnaces to obtain the desired properties. (J2)

276-J. Hot Oil Quenching Reduces Distortion in Hardening of Steel Parts. Kenneth Rose. *Materials & Methods,* v. 32, Nov. 1950, p. 62-64.

New isothermal heat treating procedure, called marquenching, which produces more uniform hardness, reduces residual stresses, and almost entirely eliminates warpage. Comparative photomicrographs.
(J26, ST)

277-J. Controlling Hardness and Microstructure During Induction Hardening. G. A. Warwick. *General Electric Review,* v. 53, Nov. 1950, p. 21-26.

Fundamental principles. Semiautomatic fixture designed and built to evaluate the merit of a method by which temperature rather than time is the criterion for duration of the heating cycle. Material studied was AISI C-1151 steel. Graphs show effect of surface temperature on hardness penetration at different power densities, case depth vs. surface temperature at different power densities, surface temperature vs. case composition, and calculated heat-flow characteristics for induction heating. (J2, ST)

278-J. The Skills Born of Specialization Solve Another Problem. Arthur E. Fulton. *Metal Treating,* v. 1, Nov. 1950, p. 4-5.

Procedure developed by J. W. Rex Co., Lansdale, Pa., for case hardening of C-1118 steel crankshafts for compressor units. (J28, CN)

279-J. Rectification of Neutral Salt Baths Operating at High Temperatures. Stewart M. De Poy. *Metal Treating,* v. 1, Nov. 1950, p. 12-16.

Three test runs were made on a neutral salt bath operating at high temperatures to determine a process for eliminating oxides from the bath. One bath was rectified with silica, one with a graphite rod inserted wholly below the surface of the bath, and one was operated without a rectifier. Results proved that rectification with a graphite rod practically eliminates decarburization of the work passing through the bath. Elimination of the oxides also prolongs electrode life. (J2)

280-J. A Practical Consideration of the Heating of Carbon Steel Rod and Wire in the Patenting Process. Walter R. Bloxdorf. *Wire and Wire Products,* v. 25, Nov. 1950, p. 965-969, 1002-1004.

Quantitative results of experiences. Improvement of the patenting of wire for use in the manufacture of wire rope. (J25, CN)

281-J. Industrial Gas Makes Metals. Arthur Q. Smith. *Canadian Metals,* v. 13, Nov. 1950, p. 8-9, 51.

Gas utilization in foundry practice, fabricating, and heat treating. (J general, E general)

282-J. Using Oxyacetylene to Reduce Stress. Harry E. Kennedy. *Canadian Metals,* v. 13, Nov. 1950, p. 36-38.

Torch heating for stress relief of welds. (J1)

283-J. Moulded Refractory Burners and Tunnels for Industrial Purposes. W. N. Smirles. *Ceramics,* v. 2, Oct. 1950, p. 427-430.

Calculations and experiments made in design. Performance data. Industrial applications to brazing, local annealing and hardening, and edge fusion of glassware.
(J general, K8)

284-J. The Anomalous Cementation Behavior of Steel. (In German.) Wilhelm Anton Fischer and Walter Koch. *Archiv für das Eisenhüttenwesen,* v. 21, Sept.-Oct. 1950, p. 345-354.

Soft-iron melts were made in basic and acid high-frequency furnaces and treated with specific deoxidants. Mn, Si, and Al contents were systematically varied and specimens were tested for sensitivity to aging and cementation behavior. Oxide inclusions were electrochemically isolated. It was found that there is a positive correlation between cementation behavior and composition of the oxide inclusions. 14 ref.
(J28, CN)

285-J. The Quench Hardenability of Steels and Their Testing. (In German.) Hermann Schottky. *Stahl und Eisen,* v. 70, Oct. 12, 1950, p. 909-925.

Reviews literature. Discusses the theory that it is more important to determine hardness depth in relation to grain size rather than hardness itself. Considerable attention to the work of Jominy and of Grossmann. 93 ref. (J26, ST)

286-J. Forging Ahead at Utica; Precision Controls Speed Precision Forging of Jet Engine Parts. Warren Walker, Jr. *Industrial Heating,* v. 17, Nov. 1950, p. 1920-1922, 1924, 1926.

Equipment and procedures of Utica Drop Forge & Tool Corp. Emphasizes heat treating and forging operations. (J general, F22, SG-h)

287-J. Salt Quench of Steel Parts Gives Uniform Hardness at Utah Plant. James Joseph. *Western Metals,* v. 8, Nov. 1950, p. 30-31.

Procedures and equipment of Eimco Corp., Salt Lake City. Large Cr-Mo steel parts used in the production of mining and construction machinery are successfully heat treated. (J2, AY)

288-J. Nodular Cast Iron; Heat Treatment and Physical Properties. Robert Y. Scapple. *Iron and Steel,* v. 23, Sept.-Nov. 1950, p. 379-382.

Results of experiments on effects of heat treatment on physical properties. Prior to heat treating, a study was made to determine how the combined carbon varied with temperature and time; what hardness can be expected; how microstructure varies with time and temperature; and the hardenability of nodular cast iron.
(J26, Q general, M27, CI)

289-J. High-Speed Steel; Some Developments in Heat Treatments. H. Carr. *Iron and Steel,* v. 23, Sept.-Nov. 1950, p. 383-388.

Reviews and correlates recent work reported in the literature. 16 ref. (J general, TS)

290-J. Blanking Dies; Heat Treatment of High-Carbon, High-Chromium Steels. J. R. Bryant. *Iron and Steel,* v. 23, Sept.-Nov. 1950, p. 411-413.

Experiments on effect of tempering temperature, decarburization, effect of soaking time at the hardening temperature, and initial treatment vs. final hardness.
(J general, TS)

291-J. Heat Treatments; Their Selection and Specification in Design. Part 3. Combination Hardness and Toughness. Norman N. Brown. *Machine Design,* v. 22, Dec. 1950, p. 137-142.

Heat treatments suitable for developing various desired combinations of hardness and toughness. Applicable to carbon and alloy steels.
(J general, Q23, Q29, CN, AY)

292-J. Good Carburizing Practice. IV. Gas Carburizing Requires Close Control. T. A. Frischman. *American Machinist,* v. 94, Dec. 11, 1950, p. 138-141.

Control of the gas carburizing process requires attention to gas distribution within the furnace, gas pressure, temperature, work loading, gas analysis, and dewpoint. Recommended procedures. (To be continued.) (J28)

293-J. Anneal Ductile Iron for Better Machinability. J. F. Kahles and R. Goldhoff. *Iron Age,* v. 166, Dec. 14, 1950, p. 105-108.

How adequate machinability and mechanical properties can be obtained in ductile iron without complete pearlite decomposition. Increased Si content speeds carbide solution, while pearlite decomposition is mainly a function of Mn content. Small amounts of carbide can be tolerated if the matrix is basically ferrite. (J23, G17, CI)

294-J. Patenting Furnace Features Lightweight Construction. W. R. Bloxdorf and A. M. Naysmith. *Iron Age,* v. 166, Dec. 14, 1950, p. 112-113.

Increased fuel economy and reduced operating costs are achieved by proper design, coupled with use of light-weight insulating firebrick.
(J25, ST)

295-J. Some Notes on the Harden-

ing and Heat Treatment of Steel. G. H. Jackson. *Machinery Lloyd* (Overseas Edition), v. 22, Nov. 25, 1950, p. 68-73, 75, 77. (A condensation).

The Fe-C equilibrium diagram; metallographic considerations; alloying elements; methods of heat treatment; isothermal hardening; high-frequency heat treatment; and subzero treatment. 14 ref.
(J general, M24, N8, ST)

296-J. Progress in Heat Treatment in the Last Twenty-One Years. P. F. Hancock. *Metallurgia*, v. 42, Nov. 1950, p. 329-333.

An illustrated review of equipment and procedures. (J general)

297-J. Methods of Improving the Quality of Autogenous Welding Rods. (In French and German.) C. G. Keel. *Zeitschrift für Schweisstechnik; Journal de la Soudure*, v. 40, Sept. 1950, p. 151-154; Nov. 1950, p. 201-205.

Shows that welds in steel subsequently torch heat treated usually have a higher notch-impact strength than welds not treated in this manner; also that high Si, Mn, and S contents reduce impact strength and effect of the torch normalizing treatment. (J2, K2, CN)

298-J. (Book) **Härterei-Technische Mitteilungen. Bd. 4.** (Technical-Hardening Symposium, Vol. 4.) R. Riebensahm, editor. 164 pages. 1950. Carl Hanser Verlag, Munich 27, Germany. 19.50 DM.

Nine papers delivered at the 4th "Hardening Colloquium at Bremen and Stuttgart. They may be divided into four groups: basic problems of hardening, heat treating and annealing; practical problems of heat treatment; results of studies on the specific behavior of a steel during different heat treating processes; and problems connected with strength determinations.
(J general, ST)

K

JOINING

719-K. Resistance Welding Controls—Why So Many? W. E. Large. *Iron Age*, v. 166, Nov. 23, 1950, p. 64-67.

The functions of the many different types of welding controls. Selecting the least expensive control consistent with the requirements of a given job. (K3)

720-K. New Applications Broaden Heatless Welding Uses. *Steel*, v. 127, Nov. 27, 1950, p. 71.

Several new modifications of the Koldweld process. A number of new applications to various nonferrous metals. (K5, EG-a)

721-K. Latest Developments in Cold Pressure Welding Widen Its Field of Application. William Dubilier. *Materials & Methods*, v. 32, Nov. 1950, p. 78-80.

An illustrated survey.
(K5, Al, EG-a)

722-K. The 1949 Smit Unionmelt Conference. (In Dutch.) *Smit Mededelingen*, v. 5, July-Sept. 1950, p. 73-94.

Introductory remarks plus the following brief articles: "Unionmelt Welding of Thin Plates", Th. Neyboer; "Right-Angle Welding With the Unionmelt Apparatus", C. J. Verzijlbergh; "Unionmelt Welding Outdoors", C. J. Verzijlbergh; "Use of Unionmelt Powder"; "Characteristics of Currents Used in Unionmelt Welding"; "Unionmelt Welding of Non-Rusting and Other Non-Corroding Types of Steel (Also of Copper and Its Alloys, Nickel, and Monel)"; and "Combined Unionmelt and Manual Welding". (K1)

723-K. Production of Glass-Lined Tanks. *Industrial Heating*, v. 17, Nov. 1950, p. 1942-1944, 1946, 1948.

Equipment and procedures at A. O. Smith Corp. Includes frit production, tank fabrication by plate bending and welding, cleaning of internal metal surfaces, spray application of glass frit, and firing.
(K11, T26, CN)

724-K. Simplified Bumper Assembly. *Applied Hydraulics*, v. 3, Dec. 1950, p. 21-22.

Completely automatic, hydraulically powered and electric-controlled machines used by Standard Steel Spring Co., Coraopolis, Pa., to rivet bumper face-bars assemblies for a leading automobile manufacturer.
(K13, T21)

725-K. More Kitchen Cabinets in Less Time. *Steel*, v. 127, Dec. 4, 1950, p. 104.

Jigs and fixtures for resistance welding of kitchen cabinets at Lyon Metal Products Inc. (K3, T10, CN)

726-K. Welded Design in Machine Bases. *Industry & Welding*, v. 23, Dec. 1950, p. 24-26, 48.

Production by H. F. Butler, Inc., Union, N. J. Use of arc welding, oxyacetylene cutting and some oxyacetylene welding.
(K1, K2, CN)

727-K. Resistance Welding Builds Model Trains. *Industry & Welding*, v. 23, Dec. 1950, p. 28.

Procedures and equipment of Lionel Corp. (K3)

728-K. A Combination of Engineering and Welding "Know-How" Helps Budd To Produce Stainless Steel Rail-Cars. Byron Gates. *Industry & Welding*, v. 23, Dec. 1950, p. 36-38, 46-47.

Resistance welding equipment and methods. (K3, T23, SS)

729-K. Arc Welding: Maintenance Tool. *Power*, v. 94, Dec. 1950, p. 109, 112.

Survey includes list of metals and alloys which can be arc welded.
(K1)

730-K. Why Consider Adhesive Bonded Structures? Seth Gunthorp and Richard G. Naugle. *Product Engineering*, v. 21, Dec. 1950, p. 138-143.

How bonds are made. U. S. Air Force specifications, also characteristics of some typical metal bonding adhesives. Joint-strength data and advantages. (K12)

731-K. Welding Heat Treatable Aluminum Alloys. B. B. Burbank. *Journal of the American Society of Naval Engineers*, v. 62, Nov. 1950, p. 811-822.

The Heliarc and Aircomatic inert-gas shielded processes. Includes diagrams and graphs showing mechanical-property gradients through the weld zone. (K1, Al)

732-K. Applications for Helium in Inert-Arc Welding. M. J. Conway. *Journal of the American Society of Naval Engineers*, v. 62, Nov. 1950, p. 1012-1016.

Reprinted from *Welding Journal*. See item 411-K, 1950. (K1)

733-K. New Welding Method Cuts Pump Fabrication Time. Earl Knowlton. *Western Metals*, v. 8, Nov. 1950, p. 24-25.

Total time for welding applications in the fabrication of high-pressure boiler feed-water pumps at Byron Jackson Co. has been cut from 20 hr. to 2½ hr. by introduction of Unionmelt welding. Forgings are mild steel (AISI 1020) and may weigh as much as two tons.
(K1, CN)

734-K. Metal-Ceramic Sealing With Manganese. H. J. Nolte and R. F. Spurck. *Tele-Vision Engineering*, v. 1, Nov. 1950, p. 14-16, 18, 39.

Process used in ceramic-envelope tube production which permits bonding of a layer of molybdenum to the ceramic, previous to brazing. This method insures good bonding with all ceramics without use of finely divided powders and special protective atmospheres. The metallizing mixture is applied by spraying or brushing, then bonded by heating in a protective atmosphere. W, Fe, Ni, and possibly other metals may be substituted for Mo. Brazing is done at any time after the firing operation. (K11, Mo)

735-K. Welding Innovations at Ryan. William P. Brotherton. *Western Machinery and Steel World*, v. 41, Nov. 1950, p. 92-93.

Two-tip and three-tip oxy-acetylene welding torches designed for special jobs on stainless steel. The two-tip torch steps up production of exhaust systems by performing two operations simultaneously—trimming the extra flange metal and welding the seam. The three-tip torch has a pair of natural-gas tips in addition to the oxy-acetylene tip. The natural gas is burned ahead and behind the welding tips for pre-heating and postheating of the steel. (K2, SS)

736-K. Welding High-Temperature Piping. E. C. Bailey. *Welding Engineer*, v. 35, Dec. 1950, p. 34-37.

Arc welding and gamma-ray inspection of 1% Cr, 0.5% Mo piping designed for steam at 1800 psi. and 1050° F. (K1, AY)

737-K. Transformers Fastened by Stud Welding. *Welding Engineer*, v. 35, Dec. 1950, p. 38-39.

Studs are welded to the inside and outside of transformers at Westinghouse. They serve many varied purposes. (K1, T1, CN)

738-K. Aluminium Window Production; A New Flash-Welding Application. *Welding*, v. 18, Nov. 1950, p. 464-471.

Some of the early developments in this field, latest types of equipment used, and general methods of fabrication. (K3, T26, Al)

739-K. Light Gauge Arc Welding; Applications of the "Carbo-Flux Process". *Welding*, v. 18, Nov. 1950, p. 473-480.

Process, depends upon use of special flux-coated filler rods and a flux coating applied to the sheets prior to welding. Used for welding thin sheets of stainless steel, Ni alloys, galvanized iron, mild steel, and copper. (K2)

740-K. The Automatic Flash Welding Machine. (Concluded.) A. G. Galle and C. A. Burton. *Welding*, v. 18, Nov. 1950, p. 481-486.

Various components designed for welding in this apparatus. Machine settings are tabulated and charted.
(K3)

741-K. Design Economies in Platework. *Welding*, v. 18, Nov. 1950, p. 487-496.

When a component is produced by a forming operation that involves plastic flow during formation, one of the greatest difficulties encountered is accurate determination of size and shape of the blank from which the component is to be formed. A new method is based on use of thin sheets of methacrylate resin to form scale models of the component. How this procedure was applied to design of a large spherical tank made of a number of irregular-shaped pieces. Procedure for erection and welding of the final tank. (K general, T26)

742-K. All-Welded Mine Trains. J. V. Thomas. *Welding*, v. 18, Nov. 1950, p. 496-498.
(K general, T28, CN)

743-K. Weld Design and Production as an Important Factor in the Economics of Machine Construction. (In German.) F. W. Griese. *Schweis-*

sen und Schneiden, v. 2, Sept. 1950, p. 232-246; Oct. 1950, p. 259-269.

Part I: Cost savings by substitution of welding for casting in production of heavy machinery and structures. Design and material factors. Part II shows that the welding method permits great versatility of design and production methods. (K general, CN)

744-K. Contact Electric Arc Welding. (In German.) P. C. Van Der Willigen. *Schweissen und Schneiden,* v. 2, Oct. 1950, p. 270-278.

Process for steel welding developed in Holland. Iron powder of the same composition as the core is dispersed in the welding-rod coating. This makes it possible to move the rod along the work while maintaining actual contact with it, thus minimizing skill required. Strengths of the welds are shown to be superior. (K1, ST)

745-K. Designing a Large Weldment. L. G. Hauser. *Machine Design,* v. 22, Dec. 1950, p. 168-170.

Previously abstracted under similar title from *Engineering Experiment Station News* (Ohio State University). See item 450-K, 1950. (K1, CN)

746-K. Applying Aluminum Roofing by Stud Welding. *Sheet Metal Worker,* v. 42, Dec. 1950, p. 74-75.
(K1, T26, Al)

747-K. Furnace Brazing of Machine Parts. Part 1. Where, Why, and How Electric-Furnace Brazing Is Being Used in 1950. Part 2. Fixtures, Joint Types, Fits, Metals and Their Properties, and Typical Furnaces Used in Brazing. H. M. Webber. *Mechanical Engineering,* v. 72, Nov. 1950, p. 863-869; Dec. 1950, p. 969-976.
16 references. (K8)

748-K. Engineering Aspects of Tool and Die Welding. Part I. Arthur R. Butler. *Tool Engineer,* v. 25, Dec. 1950, p. 21-23.

Tool and die welding is defined as the deposition by the metallic arc, atomic hydrogen, or oxy-acetylene processes of the basic types of toolsteels. The metallic arc process and the metallurgy of welding. Selection of electrodes for welding applications shown in condensed tabular form. (To be continued.)
(K1, L22, TS)

749-K. A Survey of Modern Theory on Welding and Weldability. (Continued.) D. Séférian. *Sheet Metal Industries,* v. 27, Nov.-Dec. 1950, p. 935-949, 952.

Weldability of carbon steels; nomenclature of steel constituents (structural phases); physical and chemical aspects of welding; determination of weldability; and structural investigation of welded joints. 19 ref. (To be continued.) (K9, ST)

750-K. Progress in Welding, 1929-1950. A. J. Hipperson and R. G. Burt. *Metallurgia,* v. 42, Nov. 1950, p. 347-349.

Descriptive review. (K general)

751-K (Book) Modern Welding Technique. E. T. Gill and E. N. Simons. 276 pages. Sir Isaac Pitman & Sons, Ltd., 39 Parker St., Kingsway, London W.C.2, England. 21s.

Primary aim is to serve as a textbook for the student who has no previous knowledge of welding.
(K general)

752-K. (Book) **Application of Arc Welding.** (In English.) 327 pages. Elektriska Svetningsaktiebolaget, Sweden. 21s.

Contains 15 papers selected by the judges of an international prize competition. Although a good proportion of the treatises are by Swedish authors, there are also papers from other countries. Divided into various sections: machinery, shipbuilding, bridges, buildings; conveyance and transport; large pressure vessels, containers, and piping. The papers are concerned mainly with redesign and new design of different types of structures and include many detailed drawings, strength calculations, and cost data. (K1)

L

CLEANING, COATING AND FINISHING

806-L. Durable Paint System for Transformer Tanks. J. G. Ford and A. J. Kuti. *Industrial Finishing,* v. 27, Nov. 1950, p. 38-40, 42, 45-46, 48, 50, 52, 54.

Previously abstracted from *Steel.* See item 753-L, 1950. (L26, ST)

807-L. New Mica Base Paint System Withstands Severe Atmospheric Conditions. J. G. Ford and A. J. Kuti. *Materials & Methods,* v. 32, Nov. 1950, p. 58-61.

See abstract of "Mica-Base Paint System Doubles Transformer Tank Life," *Steel,* item 753-L, 1950.
(L26, ST)

808-L. How To Reduce Pickling Brittleness in Stainless Steels. Carl A. Zapffe. *Materials & Methods,* v. 32, Nov. 1950, p. 74-77.

Use of pickling inhibitors, surface-active agents, a foaming compound (negative results), and molten-caustic pickling. The aging and recovery process for removal of H_2 from steel. Practical application of fundamental principles developed in a previous article (see item 757-L, 1950). (L12, J27, Q23, SS)

809-L. Mechanical Finishing of Metals—for Decorative Purposes. John B. Campbell. *Materials & Methods,* v. 32, Nov. 1950, p. 81-96.

The selection problem. The processes of polishing, buffing, brushing, tumbling, burnishing, and blasting. Finally, the mechanical finishing of carbon and stainless steel, aluminum, magnesium, copper, nickel, zinc, precious metals, and high-temperature alloys. (L10)

810-L. Wet Tumbling Lowers Deburring Costs. Robert H. Anderson. *Iron Age,* v. 166, Nov. 30, 1950, p. 69-71.

Equipment and procedures of Bendix Aviation Corp. Over 1,000,000 Zn, Al, Mg, and steel parts are deburred and burnished each week. Parts from 1 oz. to 15 lb. are wet tumbled in Roto-Finish barrels. Cost is less, and uniformity higher than with hand burring.
(L10, Zn, Al, Mg, ST)

811-L. Surface Protection Via Phosphate Coatings. Melvin G. Crandell. *Canadian Metals,* v. 13, Nov. 1950, p. 30-31, 33, 46-47.

"Bonderite" process for iron, steel, Zn, Cd, Al, and their alloys. The coating retards corrosion and provides a good base for paints. It is also used to facilitate deep drawing. (L14)

812-L. The Structure of Metallic Electrodeposits; Cathodic Crystal Growth. (In German.) G. I. Finch. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie,* v. 54, Oct. 1950, p. 457-458.

Illustrated by X-ray diffraction patterns. (L17, L21, M22)

813-L. Relationship Between Shape and Conditions for Electrodeposition of Metallic Crystals. (In German.) **IV. Effects of Impurities on the Formation of Block Structures in Polycrystalline Deposits.** Hellmut Fischer. **V. Effects of Shape and Orientation of the Crystals of the Substrate on Reproduction of the Base.** Hellmut Fischer, Horst Matschke, and Franz Pawlek. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie,* v. 54, Oct. 1950, p. 459-485.

Part IV. Shows that shape and orientation of the crystals vary with type and concentration of foreign materials present. Formation of five different shape types. Part V: Experiments on deposition of Cu on Cu from an acid $CuSO_4$ solution. Extent of reproduction or adaptation of electro deposit structure to that of the substrate depends mostly on ratio of grain diameter of the deposit to that of the base, and to a lesser extent on grain orientation of the base. (L17, Cu)

814-L. A Bridge Method for the Control of Electrolytic Polishing. L. F. Bates and C. D. Mee. *Journal of Scientific Instruments,* v. 27, Nov. 1950, p. 317-318.

Apparatus and typical data. (L13)

815-L. Precious Metal Plated Finishes for Die Castings. Part Two. *Die Castings,* v. 8, Dec. 1950, p. 39-41, 52, 58-59.

Reviews recent literature on silver plating of die castings. Bath compositions are tabulated.
(L17, Ag)

816-L. A Production Line Report: Simple Pretreatment for Weather-Proof Coating. *Die Castings,* v. 8, Dec. 1950, p. 42-43.

Equipment and procedures used to finish die-cast Al components of parking meters. Cleaning, drying and spray-painting. (L26, T8, Al)

817-L. Metallic Surface Coatings for Gray Iron. Charles O. Burgess. *Product Engineering,* v. 21, Dec. 1950, p. 108-113.

Methods of applying metallic coatings to gray iron—for appearance, corrosion, wear or other requirements—include spraying, welding, cementation, diffusion, hard facing, hot dipping, and electroplating. Metallic coatings applied to gray iron include Sn, Zn, Pb, Al, Cr, Ni, Cu, and their alloys. Possibilities of each type of surface treatment and the usual method of application.
(L general, CI)

818-L. Boiler Waterside Cleaning. S. Greenberg, J. L. Smith, and A. Howarth. *Journal of the American Society of Naval Engineers,* v. 62, Nov. 1950, p. 835-843.

Scale removal from the interior of boiler tubes by use of various chemicals. Effects of type of inhibitor and acid upon corrosion rates of various types of steel. (L12, R4, ST)

819-L. Research From Abroad. An Analysis of Recent Russian Work and Patents on Metal Finishing. II-III. (Concluded.) *Electroplating and Metal Finishing,* v. 3, Oct. 1950, p. 535-537; Nov. 1950, p. 572-573.
22 references. (L general)

820-L. Urea-Formaldehyde Pickling Inhibitors. *Electroplating and Metal Finishing,* v. 3, Nov. 1950, p. 565.

Some recipes for making up the above—patented by Pennsylvania Salt Mfg. Co. (L12, Fe)

821-L. Bright Nickel Plating; Some Further Udylite Patents Reviewed. *Electroplating and Metal Finishing,* v. 3, Nov. 1950, p. 567-569.

Recent patent literature concerning anti-pitting and other addition agents for bright plating solutions.
(L17, Ni)

822-L. Grinding & Polishing of Gold Articles. H. Krause. *Electroplating and Metal Finishing,* v. 3, Nov. 1950, p. 570-571. Translated from *Metalloberfläche,* v. 3, no. 1, 1949, p. 20-21.

Practical recommendations based on German practice. Mechanical, electrolytic, and barrel polishing.
(L10, L13, Au)

823-L. Linings for Plating Tanks. *Electroplating and Metal Finishing,* v. 3, Nov. 1950, p. 574-575, 580.

The case for inert linings for steel plating vats. Opinions on the relative merits of the various materials available. (L17, L26)

824-L. Mica-Base Paint System Doubles for Outdoor Exposure. J. G. Ford and A. J. Kuti. *Organic Finishing,* v. 11, Nov. 1950, p. 7-11.

See abstract of "Mica-Base Paint System Doubles Transformer Tank Life", *Steel,* item 753-L, 1950. (L26, ST)

825-L. Surface Preparation Values and Sandblasting Economics. A. J. Liebman. *Organic Finishing,* v. 11, Nov. 1950, p. 12-18, 21.

Various factors involved in determination of the optimum procedure for surface preparation and paint coating of structural steel. Various methods for surface preparation, their advantages and disadvantages. (L10, CN)

826-L. Why Pretreatment? Philip Heiberger. *Organic Finishing,* v. 11, Nov. 1950, p. 19-21.

Advantages and disadvantages of various surface treatments for metals prior to application of organic finishes. (L26)

827-L. Technique of Applying Porcelain Enamel Cover Coat Directly on Steel. M. E. McHardy. *Refrigerating Engineering,* v. 58, Dec. 1950, p. 1194-1195.

Progress of last 2 years in the single-coat method for finishing refrigerator parts at Hussmann Refrigeration, Inc. (L27, CN)

828-L. Nickel Plating From Fluoborate Solutions. Clifford Struyk and A. E. Carlson. *Plating,* v. 37, Dec. 1950, p. 1242-1246, 1263-1264.

Compares the nickel fluoborate electrolyte and other types of nickel baths. Evaluation procedures used. Buffer characteristics, resistivity, limiting current density, current efficiencies, and throwing power of the solutions; as well as physical properties of, and stress in, the nickel deposits. (L17, Ni)

829-L. Polishing and Buffing. (Concluded.) James H. Lindsey. *Plating,* v. 37, Dec. 1950, p. 1247-1251.

Second part of literature review covers buffing, buffing compounds, and buffing equipment. (L10)

830-L. Grain Size and Hardness of Nickel Plate as Related to Brightness. Harold J. Read and Rolf Weil. *Plating,* v. 37, Dec. 1950, p. 1257-1261.

Shows experimentally that there is no correlation between brightness of Ni deposits and their grain size or hardness. Although there does exist a very broad general trend which indicates that the brightness increases with decreasing grain size and increasing hardness, the specific exceptions are so numerous that they become more significant than the general trend. (L17, Q29, M27, Ni)

831-L. Metallic and Nonmetallic Coatings for Gray Iron. Charles O. Burgess. *Foundry,* v. 78, Dec. 1950, p. 76-79, 194, 196, 198, 202-203.

First of three articles on coatings successfully applied to gray-iron castings on a commercial scale to meet appearance, corrosion, wear, or other requirements. Sprayed-metal and hot-dipped coatings. 34 ref. (L16, L23, CI)

832-L. Coatings Research at Battelle Memorial Institute. E. R. Mueller and B. G. Brand. *Paint and Varnish Production,* v. 30, Sept. 1950, p. 10-12, 20-21.

General organization and procedure for handling research at Battelle. Facilities for coatings research and typical projects. Battelle's North Florida Research Station for study of marine fouling, corrosion, deterioration, etc. 12 ref. (L general, A9, R general)

833-L. Dyed Aluminium Powder. Gunter W. Wendon. *Paint Manufacture,* v. 20, Nov. 1950, p. 397-400.

Procedure for preparation of dyed powder, which resembles ordinary Al flake powder in shape, structure, and particle-size distribution. It differs from it in having a colored surface. General features, practical stages, patented processes, difficulties experienced, leafing power, pigment suitability, methods of application, and future work. (L26, H12, Al)

834-L. Rust Proofing Improved by Polymerized Phosphate Coat. Don Vance. *Western Metals,* v. 8, Nov. 1950, p. 25-26.

Advantages of "Polykote" process developed by Kelite Products, Los Angeles. A catalyst is used to produce polymerization of the phosphate crystals, resulting in continuous rather than discontinuous protection. (L14)

835-L. A Noble Coat of Tin. *Steelways,* v. 6, Nov. 1950, p. 26-27.

Electrolytic tinplate line. (L17, Sn, CN)

836-L. Anti-Corrosion Tape for Service Pipes. George M. Carter, Jr. *Gas Age,* v. 106, Nov. 23, 1950, p. 42-43, 76, 78.

Illustrations show how one gas company protects service pipe against corrosion by use of "Scotch" brand electrical tape No. 22, which consists of a polyvinyl chloride film with a specially developed pressure sensitive adhesive on one side. L26, R10)

837-L. Cobalt Reduction Theory of Sheet Iron Enamels. J. H. Healy and A. J. Andrews. *Finish,* v. 7, Dec. 1950, p. 22-23.

Progress to date in an intensive study of the structure of sheet-iron ground coats and the function of cobalt in the development of adherence. (L27, CN)

838-L. The Synthetic Enamel Department Goes Modern. Russell Wydeen. *Finish,* v. 7, Dec. 1950, p. 25-28.

Metal preparation and synthetic finishing operations for refrigerators and home freezers. (L27, CN)

839-L. Molten Caustic Bath Provides Rapid, Efficient Method of Cleaning Steel Parts for Painting. James E. Fritts. *Products Finishing,* v. 15, Dec. 1950, p. 10-16, 18.

Newly developed prepaint cleaning cycle for steel parts. Equipment and procedures of Ternstedt Div., General Motors Corp., Columbus, Ohio. (L12, ST)

840-L. Plating Without Nickel Chloride. *Products Finishing,* v. 15, Dec. 1950, p. 18, 20, 22.

Possible substitutes for nickel chloride as a source of Cl ions in the plating bath. (L17)

841-L. Filter Out Your Plating Rejects. Ezra A. Blount. *Products Finishing,* v. 15, Dec. 1950, p. 24-36, 38, 40, 42.

Principles and procedures for plating solution clarification, namely the removal of objectionable contaminants either mechanically by filtration or by adsorption on activated carbon. Commercial equipment. 18 ref. (L17)

842-L. Spotlighting Finishing Progress. Allen G. Gray. *Products Finishing,* v. 15, Dec. 1950, p. 48, 50, 52, 54, 56, 58, 60, 62.

Surveys the following: Paper by P. O. Powers on effect on finishes of reactions of resins with drying oils; use of tinplate as undercoat for paint (Tin Research Institute); rhodium plating (E. M. Wise); finishing Be-Cu parts (John T. Richards); silicide coatings for Mo and vapor deposition of refractory coatings (Battelle Institute papers). (L general)

843-L. Maytag Takes on Porcelain Enameling. *Ceramic Industry,* v. 55, Dec. 1950, p. 52-55.

Plant features automatic spray pickling and a special wire-cooling booth at the exit of the furnace. (L27, CN)

844-L. Anodic Treatment of Manufactured Products. (Concluded.) P. Smith and P. Shaw. *Light Metals,* v. 13, Sept.-Oct. 1950, p. 497-500.

Necessity for avoidance of assembly systems or designs which lead to trapping of electrolytes. (L19, Al)

845-L. Aspects of Jobbing Electroplating; Need for Technical Control. A. Whittaker. *Metal Industry,* v. 77, Nov. 10, 1950, p. 184-185. (L17)

846-L. The Nickel Shortage; Maintaining Production Under Present Conditions. C. W. J. Morley. *Metal Industry,* v. 77, Nov. 24, 1950, p. 218-219.

Means of reducing metal losses in the electroplating industry. (L17, Ni)

847-L. Hot-Dip Tinning of Cast Iron. W. E. Hoare. *Foundry Trade Journal,* v. 89, Nov. 23, 1950, p. 411-414, 427.

Principles and methods of surface preparation, including electroplating, chemical oxidation processes, and fluxing. (L16, CI, Sn)

848-L. Evaluation of Underwater Paints for Steel Surfaces. W. Husse. *Paint and Varnish Production,* v. 30, Apr. 1950, p. 7, 13-15.

Results of a study initiated by the German Government in 1936. Because of World War II and the postwar adjustment period, results were not made available until Dec. 1949, when they were given in the form of a report in Berlin. (L26, ST)

849-L. Fast Abrasive Belt Finishing Lops Off Costs. *Steel,* v. 127, Dec. 11, 1950, p. 88-90; Dec. 18, 1950, p. 100-102.

Relatively new method and some of its applications. Cooler, faster cutting is one of its greatest advantages. (L10)

850-L. Sulphuric Acid Cleaning and Coating of Rod and Wire in a Straightline Operation. R. H. Hertzog. *Wire and Wire Products,* v. 25, Dec. 1950, p. 1047-1048, 1079-1082.

Procedures and equipment of John A. Roebling's Sons Co., Trenton, N. J. Material processed is carbon steel. (L12, CN)

851-L. Molten Salt Descaling. H. Clark Smith, Jr. *Wire and Wire Products,* v. 25, Dec. 1950, p. 1050-1051, 1085-1089.

Experiences of Wilbur B. Driver Co., in setting up and operating a molten-salt cleaning bath for descaling of stainless steels and high Ni-Cr alloys. (L12, SS, Ni)

852-L. New Process Slashes Cost of Phosphoric Acid Pickling. C. F. Paulson and M. E. Gilwood. *Iron Age,* v. 166, Dec. 14, 1950, p. 97-99.

New ion-exchange process for reclaiming spent acid. Cost of phosphoric acid pickling can be cut 66%. In many cases, cost will be below that of the less desirable pickling with H_2SO_4. (L12, ST)

853-L. Cleaning and Preparation of Metals for Electroplating. 1. Critical Review of the Literature. Henry B. Linford and Edward B. Saubestre. *Plating,* v. 37, Dec. 1950, p. 1265-1269.

Classifies the various methods in current use. The principles of detergency. Representative electrolytic and nonelectrolytic cleaning solutions for brass, steel, and Al are tabulated. (To be continued.) (L12, L13)

854-L. Progress in Metal Finishing Since 1929. S. Wernick. *Metallurgia,* v. 42, Nov. 1950, p. 339-344.

An illustrated review. (L general)

855-L. Hydrate Formation During Electrolysis of Nickel. (In Russian.) A. L. Rotinyan and V. Ya. Zel'des. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 23, Sept. 1950, p. 936-941.

Hydrate formation of additions of Cu and tri and bivalent Fe to the Ni electrolyte was studied by means of electrometric-titration curves, glass electrode, and the Tyndall cone. (L17, Ni)

856-L. (Book) Jahrbuch Der Galvano-Technik, 1950. (Plating Technology Yearbook, 1950.) Oskar P. Kramer, editor. 300 pages. 1950. Metall-Verlag, G.m.b.H, Berlin W.15, Germany. 5.40 DM.

A comprehensive survey of the most recent advances in the various processes for combatting corrosion. Theoretical bases and practical processes of electroplating. Faults, corrective measures, bath supervision, tests on the coating, and the more important chemicals. Protection of light-metal and Zn surfaces, electrolytic polishing, hard chromium plating, phosphating and metal spraying, also protective varnish and acid-resistant coatings. (L17)

M

METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

358-M. Tearline Patterns in Ferrochromium. C. A. Zapffe and F. K. Landgraf. *Journal of Applied Physics,* v. 21, Nov. 1950, p. 1197-1198.

The problem of distinguishing between Type I and II fracture patterns in interpretation of fractographs. Several complex examples of 70% Cr ferrochromium. Correct identification often has important implications for theories of the solid state. (M23, Fe-n, Cr)

359-M. The Iron—Iron Phosphide—Copper Phosphide—Copper System. (In German.) Rudolf Vogel and Josef Berak. *Archiv für das Eisenhüttenwesen,* v. 21, Sept.-Oct. 1950, p. 327-336.

The constitution diagram was completely established by thermal and microscopic methods. Results confirm the fact that iron has a greater affinity for P than for Cu. (M24, Fe, Cu)

360-M. Electron-Microscope Structure Studies of Laminar Pearlite and of Pearlite in a Chromium Magnet Steel. (In German.) Angelica Schrader. *Archiv für das Eisenhüttenwesen,* v. 21, Sept.-Oct. 1950, p. 337-343.

Results indicate the possibility that the carbide grains of coarse laminar or coarse granular pearlite are only very slightly attacked by the etchant, whereas the carbide in fine pearlite is more severely attacked. This may explain why the electron microscope reveals coarse pearlite more distinctly than the fine form. Study of the above steel shows also that the replica process reveals considerably more structural detail than do photomicrographs. (M21, AY, SG-n)

361-M. Discussion—Institute of Metals Division; New York Meeting, February 1950. *Journal of Metals,* v. 188, Nov. 1950; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, 1950, p. 1353-1381.

Covers the following papers: "The Iron-Nitrogen System", V. G. Paranjpe, M. Cohen, M. B. Bever, and C. F. Floe (Feb. 1950); "The System Chromium-Carbon", D. S. Bloom and N. J. Grant (Jan. 1950); "Carbides in Isothermally Transformed Chromium Steels", W. Crafts and J. L. Lamont (Dec. 1949); "Carbides in Long-Tempered Vanadium Steels", W. Crafts and J. L. Lamont (Mar. 1950); "A Study of the Iron-Chromium-Nickel Ternary System", J. W. Pugh and J. D. Nisbet (Feb. 1950); "Faults in the Structure of Copper-Silicon Alloys", C. S. Barrett (Jan. 1950); "Undercooling of Minor Liquid Phases in Binary Alloys", C. C. Wang and C. S. Smith (Jan. 1950); "Measurement of Relative Interface Energies in Twin Related Crystals", C. G. Dunn, F. W. Daniels, and M. J. Bolton (Feb. 1950); "Titanium Binary Alloys", C. M. Craighead, O. W. Simmons, and L. W. Eastwood (Mar. 1950); "Some Observations on the Recovery of Cold Worked Aluminum", T. V. Cherian, P. Pietrokowsky, and J. E. Dorn (Dec. 1949); "Effect of Prestraining Temperatures on the Recovery of Cold Worked Aluminum", T. E. Tietz, R. A. Anderson, and J. E. Dorn (Dec. 1949); "The Properties of Sand Cast Magnesium-Rare Earth Alloys", T. E. Leontis (Dec. 1949); "Some Effects of Phosphorus and Nitrogen on the Properties of Low Carbon Steel", G. H. Enzian (Feb. 1950); "Intergranular Parting of Brass During Anneals", F. H. Wilson and E. W. Palmer (Dec. 1949); "Effect of Solute Elements on the Tensile Deformation of Copper", R. S. French and W. R. Hibbard, Jr. (Jan. 1950); "Electrical Resistivity and Thermoelectric Power of Antimony-Selenium Alloys", B. D. Cullity, M. Telkes, and J. T. Norton (Jan. 1950); "Effects of Three Interstitial Solutes (Oxygen, Nitrogen, and Carbon) on the Mechanical Properties of High-Purity, Alpha Titanium", W. L. Finlay and J. A. Snyder (Feb. 1950); "A Preliminary Investigation of the Zirconium-Beryllium System by Powder Metallurgy Methods", H. H. Hausner and H. S. Kalish (Jan. 1950); "Cemented Titanium Carbide", J. C. Redmond and E. N. Smith (Dec. 1949); "The Elastic Coefficients of Single Crystals of Alpha Brass", R. W. Fenn, Jr., W. R. Hibbard, Jr., and H. A. Lepper, Jr. (Jan. 1950); "Behavior of Pores During the Sintering of Copper Compacts, F. N. Rhines, C. E. Birchenall, and L. A. Hughes (Feb. 1950); "Self-Diffusion in Alpha and Gamma Iron", C. E. Birchenall and R. F. Mehl (Jan. 1950); "Diffusion Coefficient of Carbon in Austenite", C. Wells, W. Batz, and R. F. Mehl (Mar. 1950); and "The Growth of Austenite as Related to Prior Structure", A. E. Nehrenberg (Jan. 1950). (M general, N general, P general, Q general)

362-M. Sigma Phase in Stainless: What, When, and Why. George V. Smith. *Iron Age,* v. 166, Nov. 30, 1950, p. 63-68; Dec. 7, 1950, p. 127-132.

Attempts to correlate and clarify present confusion concerning occurrence and identification, mode of formation, possible existence of more than one kind of sigma, and desirability or undesirability of its presence. Includes phase diagrams and photomicrographs. Part II: Effect on mechanical properties and corrosion resistance. How this phase can be converted into harmless delta ferrite by heat treatment; however, this restoration method may produce grain growth. 17 ref. (M26, N8, Q general, R general, SS)

363-M. Preparation of Samples for Metallographic Examination. G. W. Graves. *Foundry,* v. 78, Dec. 1950, p. 163-164. Reprinted from *Burrell Announcer,* No. 50-10-40 (Burrell Corp., Pittsburgh).

Condensed description of recommended procedures. (M21)

364-M. Preparation, Structure, and Applications of Thin Films of Silicon Monoxide and Titanium Dioxide. Georg Hass. *Journal of the American Ceramic Society,* v. 33, Dec. 1, 1950, p. 353-360.

Vacuum-deposited thin films of SiO decompose to Si and SiO_2 when heat treated in an inert atmosphere, and oxidize in SiO_2 when heated in air. Their oxidation rates in air at various temperatures were measured by optical means. SiO is especially suitable for depositing protective layers on first-surface mirrors and for preparing replica and support films for electron-microscope and electron-diffraction studies. TiO_2 films prepared by evaporating Ti and oxidizing it in air at 400-500° C. have a rutile structure. Such rutile films can be used for splitting beams and for increasing the reflectivity of first-surface mirrors. 23 ref. (M23, R2)

365-M. An Equipment for the Microscopic Examination of Metals and Crystals in Polarized Light at Temperatures From −130 to +35° C. J. C. Monier and R. J. Hocart. *Journal of Scientific Instruments,* v. 27, Nov. 1950, p. 302.

Includes diagram. (M21)

366-M. Multiple-Film Back-Reflection Camera for Atomic Strain Studies. Anthony B. Marmo. *National Advisory Committee for Aeronautics,* Technical Note 2224, Nov. 1950, 22 pages.

New X-ray diffraction technique, which eliminates some of the principal limitations and reduces others imposed by conventional single-film back-reflection methods. Comparative analysis of the results indicated that a more detailed analysis of atomic strain could be obtained by the new method. (M22)

367-M. Lattice Parameters of Magnesium Alloys. Robert S. Busk. *Journal of Metals,* v. 188, Dec. 1950; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, 1950, p. 1460-1464.

The effect of solute additions. Empirical equations derived from the data permit calculation of the lattice parameters of ternary solid solutions from binary data. 14 ref. (M26, Mg)

368-M. Lattice Parameters of Martensite and of Austenite. Jozef Mazur. *Nature,* v. 166, Nov. 11, 1950, p. 828.

Lattice parameters established for steels containing 1.25, 1.20, 0.90, 0.89, 0.75, and 0.45% C. Methods were described in previous communications. (M26, CN)

369-M. Structure of Cobalt Disilicide. (In French.) Felix Bertaut and Pierre Blum. *Comptes Rendus* (France), v. 231, Sept. 25, 1950, p. 626-628.

The Co-Si system was studied by electrodeposition of Si on Co. Phases which appeared successively were Co_2Si, CoSi, and $CoSi_2$, the latter previously unreported. Existence of $CoSi_2$ was verified by direct synthesis by fusion of Co and 2Si. Interpretation of Debye-Scherrer diagrams gave information on crystal structure and unit-cell dimensions. (M26, Co, Si)

370-M. Application of Electron Diffraction to the Study of Alloy Single Crystals. (In French.) Heinz Raether. *Comptes Rendus* (France), v. 231, Oct. 2, 1950, p. 653-655.

Technique for the above, including method of preparation of the single crystals. Results of a typical investigation of $AgCu_3$. (M21, M26)

371-M. The Crystal Structure of $PtSn_4$. (In German.) Konrad Schubert and Ulrich Rösler. *Zeitschrift für Metallkunde,* v. 41, Sept. 1950, p. 298-300.

See abstract from *Zeitschrift für Naturforschung* item 145-M, 1950. (M26, Pt, Sn)

372-M. Definition of Microstructure With the Aid of Structure Series. (In German.) Franz Roll. *Metall,* v. 4, Nov. 1950, p. 463-466.

Structure series based on grain size, segregation, phases, etc., are a valuable aid in evaluation of the microstructures of metals and alloys. Photomicrographs and a table illustrate application of the concept. (M27)

373-M. Developments in Laboratory Methods and Apparatus. H. J. Axon and K. M. Entwistle. *Metallurgia,* v. 42, Nov. 1950, p. 349-352.

Reviews developments of past 21 years in methods and apparatus for laboratory examination of metals and alloys. Includes structural investigation, analysis, physical, and mechanical testing.
(M21, M22, M23, S11, P general, Q general)

374-M. Joint Discussion on the Papers—"Further X-Ray Study of the Equilibrium Diagram of the Fe-Ni System", by E. A. Owen and Y. H. Liu; **"Free-Energy and Metastable States in the Fe-Ni and Fe-Mn Systems",** by F. W. Jones and W. I. Pumphrey; **"Microscopical Studies on the Iron-Nickel-Aluminium System. Part I. $\alpha + \beta$ Alloys and Isothermal Sections of the Phase Equilibrium Diagram",** by A. J. Bradley; and **"Constitution of Iron-Nickel-Chromium Alloys at 650° to 800° C.",** by W. P. Rees, B. D. Burns, and A. J. Cook. *Journal of the Iron and Steel Institute,* v. 166, Nov. 1950, p. 200-212.

Above papers were published in the Oct., Sept., and July 1949 issue, respectively. Includes authors' replies. (M24, P12, Fe, Ni, Mn, Al, Cr)

375-M. Electron-Microscopic Studies of Metallic Structures by Means of the Replica Method. (In Swedish.) M. Hillert and S. Modin. *Jernkontorets Annaler,* v. 134, no. 9, 1950, p. 495-514.

A general survey supplemented by the authors' experiences. Attempts to use polystyrene-aluminum replicas were not very successful. Experiments with Formvar replicas were successful. The limit of resolution seemed to lie at about 300Å. A eutectic carbon steel was investigated after different heat treatments. Pearlitic and bainitic structures obtained are described. 14 ref. (M21)

N

TRANSFORMATIONS AND RESULTING STRUCTURES

268-N. Frequency Factor and Activation Energy for the Volume Diffusion of Metals. G. J. Dienes. *Journal of Applied Physics,* v. 21, Nov. 1950, p. 1189-1192.

Mathematical analysis and correlation of experimental data for various binary systems. 17 ref. (N1)

269-N. Measurements on the Diffusion of Interstitial Atoms in B.C.C. Lattices. C. A. Wert. *Journal of Applied Physics,* v. 21, Nov. 1950, p. 1196-1197.

Alloys of interstitial dissolved atoms in b.c.c. lattices offer the possibility that one can make extremely accurate measurements of the rate of diffusion of the solute atoms. Diffusion of C in α-Fe offers an example of this technique. Measurements of diffusion of C in Ta and Cb and of N in α-Fe. (N1)

270-N. Effect of Phase Changes Below the A_1 Point on the Properties of Commercial Iron. (In German.) Werner Köster. *Archiv für das Eisenhüttenwesen,* v. 21, Sept.-Oct. 1950, p. 305-314.

Miscellaneous property changes in the above temperature range are the result, primarily, of the reduced solubility of carbon and nitrogen in α-Fe. Experiments showed that age hardening is caused by the precipitation of finely dispersed cementite. 60 ref.
(N8, N7, P general, Q general, Fe)

271-N. Crystal Structures and Transformations in Indium-Thallium Solid Solutions. Lester Guttman. *Journal of Metals,* v. 188, Dec. 1950; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, 1950, p. 1472-1477.

X-ray diffraction and metallographic studies of the In-Tl system showed existence of a transformation from face-centered tetragonal to face-centered cubic in In-rich solutions. The equilibrium diagram was revised to conform with these measurements and published thermal data. Range covered was 0-75 atomic % Tl. 13 ref.
(N9, M24, In, Tl)

272-N. Crystallography of Cubic-Tetragonal Transformation in the Indium-Thallium System. J. S. Bowles, C. S. Barrett, and L. Guttman. *Journal of Metals,* v. 188, Dec. 1950; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, 1950, p. 1478-1485.

The diffusionless transformation from cubic to tetragonal in In-Tl alloys on cooling was analyzed by metallographic and X-ray measurements. Theories of atom movements are tested by precision pole figures, and it is concluded that the transformation occurs by a double shear process. Appendix gives mathematical proof that the cubic-tetragonal transformation can be accomplished by two shears. 14 ref.
(N9, N1, M24, In, Tl)

273-N. The Mechanism of Self-Diffusion in Alkali Metals. Heinz R. Paneth. *Physical Review,* ser. 2, v. 80, Nov. 15, 1950, p. 708-711.

On the basis of calculations of the activation energies of various ring, vacancy, and interstitial mechanisms in alkali metals, the most probable mechanism of self-diffusion was found to be the rapid transmission of short linear regions of compression along body-diagonals in the body-centered cubic lattice. 11 ref. (N1, EG-e)

274-N. Interpretation of the Diffraction of X-Rays by Alloys Subject to Structural Hardening. (In French.) André Guinier. *Comptes Rendus* (France) v. 231, Oct. 2, 1950, p. 655-657.

Critically analyzes the attempt of Geisler and Hill to provide a general explanation of X-ray diffraction phenomena accompanying the precipitation of a supersaturated solid solution. Data of experimental investigation previously reported by Guinier and by Jacquet and Guinier for an Al-Cu and a Cu-Be alloy, respectively, are said to conflict with the theory of Geisler and Hill. A new interpretation of the X-ray diffraction patterns is proposed.
(N7, M22)

275-N. Studies on the Structure of Hard Chromium Plate. *Journal of the Electrochemical Society,* v. 97, Dec. 1950, p. 466-471.

Discussion of above paper by Cloyd A. Snavely and Charles L. Faust. See item 61-N, 1950. (N5, Cr)

276-N. Investigation of the Initial Stages of Aging in Aluminum Alloys. (In Russian.) N. N. Buinov and R. M. Lerinman. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 74, Oct. 1, 1950, p. 707-710.

Investigated using the electron microscope, on Al-Cu (4% Cu), Al-Ag (10% Ag), and Al-Mg-Si (1.4% Mg_2Si), differently heat treated. Results are in disagreement with X-ray studies of the same specimens with respect to time of inception of dissociation. A tentative explanation is proposed. (N7, Al)

277-N. The Production of Monocrystals of Boron Carbide. (In Russian.) I. L. Zagyanskii, G. V. Samsonov, and N. V. Popova. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 74, Oct. 1, 1950, p. 723-724.

An improved method. Boron carbide (B_4C) monocrystals were obtained in sizes up to 10 mm. long and 0.25-0.5 mm. thick. Hardness of these crystals surpasses that of corundum and of carborundum.
(N12, C-n, B)

278-N. Solubility of Nitrogen in Liquid Chromium and in Chromium-Silicon Melts. (In Russian.) V. S. Mozgovoi and A. M. Samarin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 74, Oct. 1, 1950, p. 729-732.

Investigated for commercial-grade Cr (1.04% Fe, 0.6% Al, 0.2% Si, 0.15% N) and Si (0.78% Al, 0.20% Fe, and 0.04% C). Time of contact of the melt with N_2 was 40 min. at 1600-1750° C. It was found that solubility of N_2 decreases with increasing temperature and that an increasing amount of Si in the mixture decreases the solubility of N_2. Data are charted. (N12, Cr, Si)

279-N. Influence of Molybdenum Additions on the Mechanism of Eutectoid Transformation of Austenite. (In Russian.) M. E. Blanter. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 74, Oct. 1, 1950, p. 791-793.

Results of investigation.
(N8, ST, AY)

P

PHYSICAL PROPERTIES AND TEST METHODS

374-P. The Magnetic Anisotropy of α-$NiSO_4 \cdot 6H_2O$ Between 13 and 295° K. A Torsion Balance for Magnetic Anisotropy Measurements. J. W. Stout and Maurice Griffel. *Journal of Chemical Physics,* v. 18, Nov. 1950, p. 1449-1454.

Data and apparatus. (P16)

375-P. Activity Measurements on Liquid Thallium Alloys. (In German.) Anna-Luise Vierk. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie,* v. 54, Oct. 1950, p. 436-437.

Results of emf. measurements on Tl-Bi and Tl-Sn alloys using a special glass containing Tl ions as electrolyte and iron wire as electrodes. 10 ref. (P15, Tl, Bi, Sn)

376-P. Velocity of Sound in Metals. S. Bhagavantam and K. Ramavataram. *Proceedings of the Indian Academy of Sciences,* v. 32, sec. A, Sept. 1950, p. 197-199.

Shows experimentally, by applying the ultrasonic wedge method, that sonic velocity in brass and Al plates is independent of frequency in the range 1-10 megacycles. In

order to obtain this result unambiguously, it was necessary to use plates of proper thicknesses and lateral dimensions and to eliminate coupling and boundary effects. (P10, Al, Cu)

377-P. Comparative Growth of Gray Iron Vs. Nodular Iron. Thomas E. Eagan. *Foundry,* v. 78, Dec. 1950, p. 96-99, 203-204.

Compares results of investigation with those reported elsewhere. Seven grades of gray iron and three of nodular iron were tested in an oxygen-free atmosphere in both the as-cast and annealed conditions. Effect of growth on physical properties. (P10, Q general, CI)

378-P. Thermal Conductivity and Heat Capacity of Beryllium Carbide. John J. Neely, Charles E. Teeter, Jr., and James B. Trice. *Journal of the American Ceramic Society,* v. 33, Dec. 1, 1950, p. 363-364.

Thermal conductivity was determined within an accuracy of ±200% from 300 to 950° C. Enthalpy and mean heat capacity were determined within 10-15% from room temperature to 1100° C. P11, P12, C-n, Be)

379-P. Oxide Film Formation on the Surface of Metals in Aqueous Solutions and the Evaluation of Their Standard Potentials. II. The Mercury Electrode. S. E. S. El Wakkad and T. M. Salem. *Journal of Physical & Colloid Chemistry,* v. 54, Dec. 1950, p. 1371-1383.

Investigation deals with metallic mercury. From a study of behavior of the electrode in the presence and absence of air after applying a special technique for removal of the oxide film, conditions under which a persistent oxide film is absent from the surface of metallic mercury in aqueous solutions were determined. Only under these conditions can the true thermodynamic standard electrode potential, as well as other electro-chemical properties of metallic mercury, be determined. 25 ref. (P15, R2, Hg)

380-P. Studies on Explosive Antimony. IV. The Heat of Explosion at 40° C. C. C. Coffin and C. E. Hubley. *Canadian Journal of Research,* sec. B, v. 28, Oct. 1950, p. 644-647.

Under certain conditions of concentration, temperature, and current density, Sb may be electrodeposited from $SbCl_3$-HCl solutions in an amorphous form which on heating, scratching, or mechanical shock undergoes a more or less explosive crystallization. This deposit appears to be the only example of a metal which can be obtained in any quantity in the vitreous or supercooled condition. Heat of the "explosive" crystallization of electrodeposited amorphous Sb was directly determined at 40° C. in a modified Bunsen-type calorimeter using benzalacetone as the working substance. (P12, N12, Sb)

381-P. Ferromagnetism and Anti-Ferromagnetism. *Nature,* v. 166, Nov. 4, 1950, p. 777-779.

Proceedings of international conference held at Grenoble, France, in July 1950. About 50 papers were read and discussed. 20 ref. (P16)

382-P. Recent Ideas and Experiments in Magnetism. L. F. Bates. *Proceedings of the Institution of Electrical Engineers,* v. 97, pt. 1, Nov. 1950, p. 340-350.

Newer aspects of the domain theory of ferromagnetism. Experimental apparatus and procedures. "Fir-tree" and "Bitter" patterns formed on single crystals of iron. 16 ref. (P16, SG-n, p)

383-P. On the Hall Effect in Ferromagnetics. Emerson M. Pugh, N. Rostoker, and A. Schindler. *Physical Review,* ser. 2, v. 80, Nov. 15, 1950, p. 688-692.

With precise measurements at magnetic fields well above those required for saturation, it is shown that the Hall electric field per unit current density consists of two distinct parts. Its value averaged between poles is given by $R_0H + R_1M$, where H and M are magnetizing force and average intensity of magnetization, respectively, in the sample. Data for Ni. 10 ref. (P16, Ni)

384-P. The Surface Photoelectric Effect. M. J. Buckingham. *Physical Review,* ser. 2, v. 80, Nov. 15, 1950, p. 704-708.

Theoretical expressions describing photo-electric emission from a metal surface are derived, taking account of the dependence, established by Bardeen, of effective surface barrier on momentum of the impinging electron, due to exchange and correlation forces in the interior. Influence of transmission coefficient of the surface-potential barrier on the photo-electric properties of a metal. An experiment is proposed for determining directly the variation with energy of the transmission coefficient. 11 ref. (P15)

385-P. Theory of Superconductivity. L. Tisza. *Physical Review,* ser. 2, v. 80, Nov. 15, 1950, p. 717-726.

A quantum-mechanical model exhibits the characteristic properties of superconductors. Localized "atomic" wave functions are used to construct many-electron wave functions obeying the exclusion principle and corresponding to definite electronic localization. 38 ref. (P15)

386-P. A Note on Tisza's Theory of Superconductivity. J. M. Luttinger. *Physical Review,* ser. 2, v. 80, Nov. 15, 1950, p. 727-729.

The equation of F. London connecting the electric field and the current in a superconductor is derived on the basis of Tisza's theory of superconductivity. (See above abstract; item 385-P. (P15)

387-P. Hall Coefficient and Resistivity of Thin Films of Antimony Prepared by Distillation. W. F. Leverton and A. J. Dekker. *Physical Review,* ser. 2, v. 80, Nov. 15, 1950, p. 732-736.

An a.c. method for measuring Hall coefficient, and an apparatus for the preparation of very pure evaporated metal films. This apparatus eliminates such sources of contamination as hot filaments. The effect of annealing on both Hall coefficient and resistivity of evaporated films of antimony was examined. A tentative explanation for the observed increase in Hall coefficient and decrease in resistivity, based on assumption of partial recombination of electrons and holes. 18 ref. (P16, Sb)

388-P. The Superconductivity of Columbium. D. B. Cook, M. W. Zemansky, and H. A Boorse. *Physical Review,* ser. 2, v. 80, Nov. 15, 1950, p. 737-743.

Isothermal critical magnetic-field curves and zero-field transitions for several annealed specimens of Cb were measured by an a.c. mutual-inductance method, at temperatures from 5.1° K. to the zero-field transition temperature. Results on a different grade of Cb with a Ta content of 0.4%, according to neutron-scattering measurements, were in agreement with data obtained from Cb containing 0.2% max. Ta. 20 ref. (P15, Cb)

389-P. Theory of Magnetic Properties of Anisotropic Permanent Magnet Alloys. K. Hoselitz and M. McCaig. *Physical Review,* ser. 2, v. 80, Nov. 15, 1950, p. 757-758.

Criticizes theory proposed for the magnetic properties of Alnico V, in a recent letter of Kittle, Nesbitt, and Shockley. (See item 106-P, 1950.) Outlines alternative theory. (P16, SG-n)

390-P. Susceptibility and Magnetic Anisotropy of Indium Single Crystals. J. Verhaeghe, G. Vandermeerssche, and G. Le Compte. *Physical Review,* ser. 2, v. 80, Nov. 15, 1950, p. 758.

Results of measurements on highly purified material. (P16, In)

391-P. Magnetic Momenta and Curie Points of Hexagonal and Cubic Varieties of Cobalt. (In French.) André J. P. Meyer and Pierre Taglang. *Comptes Rendus* (France), v. 231, Sept. 25, 1950, p. 612-614.

Investigated for the ε and γ types of Co. Relationship between magnetic moment and Curie points is established and, on the basis of this equation, Curie points for both types of Co are established. Experimental data prove the validity of the theory. (P16, Co)

392-P. The Thermal Conductivity of "Chroman B2 Mo" at Low Temperatures. (In German.) F. Schmeissner and H. Meissner. *Zeitschrift für angewandte Physik,* v. 2, Oct. 10, 1950, p. 423-424.

Thermal conductivity was determined at temperatures of 88, 70, and 3.9° K. The alloy contains about 60% Ni, 15% Cr, 16% Fe, 2% Mn, and 7% Mo. Data are supplemented by a brief discussion of the possible effect of hardness on thermal conductivity. (P11, Ni)

393-P. Anisotropic Energy Distribution in Nickel. (In Russian.) L. V. Kirenskii. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 74, Sept. 11, 1950, p. 209-211.

Experimentally investigated, especially the first and second constants of anisotropy, in the range between 90° K. and the Curie point, using a monocrystalline specimen of Ni. Technique and data. (P12, Ni)

394-P. Some Applications of Electrochemical Thermodynamics. Marcel Pourbaix. *Corrosion* (Technical Section), v. 6, Dec. 1950, p. 395-404.

Affinity and velocity of an electrochemical reaction, the magnitude and sign of which can be measured. Electrochemical phenomena which can take place on the same metallic surface. This treatment is applied to the behavior of Fe in the presence of aqueous solutions; also to a fundamental study of reactions between hydrogen and some oxidizing substances on a platinum surface reported by Wagner and Traud in 1938. 16 ref. (P12, P15, R1, Fe)

395-P. Changes in Conductivity of Germanium Induced by Alpha-Particle Bombardment. W. H. Brattain and G. L. Pearson. *Physical Review,* ser. 2, v. 80, Dec. 1, 1950, p. 846-850.

Results of experimental and theoretical study on changes in electrical conductivity. (P15, Ge)

396-P. Anomalous Heat Flow in Superconductors. K. Mendelssohn and J. L. Olsen. *Physical Review,* ser. 2, v. 80, Dec. 1, 1950, p. 859-862.

Measurements of heat flow in the superconductive and in the normal state were carried out on pure Pb and Pb containing a small quantity of Bi. Dependence of heat conduction on magnetic field and temperature was determined. The alloy shows a smaller heat conduction in the intermediate state than in either the superconductive or the normal state. 10 ref. (P11, Pb)

397-P. Periodic Deviations in the Schottky Effect for Tantalum. R. J. Munick, W. B. LaBerge, and E. A. Coomes. *Physical Review,* ser. 2, v. 80, Dec. 1, 1950, p. 887-891.

Periodic deviations from the Schottky law in the thermionic

emission from patchy surfaces of Ta and Th on Ta were measured for fields up to 3 x 10^5 volts cm^{-1}, and at temperatures of 1200 and 1500° K. A method was found for separating periodic deviations from patch effects. 16 ref. (P15, Ta)

398-P. Magnetoresistance of Bismuth at 3000 Megacycles. C. W. Heaps. *Physical Review,* ser. 2, v. 80, Dec. 1, 1950, p. 892-893.

Magnetoresistance for frequencies of 3.5 Mc. was found to be of the same magnitude as for steady direct currents. On the other hand, for long infrared waves (8μ) the magnetoresistance is zero. Using a resonating bismuth cavity and a slotted wave-guide, measurements of standing-wave ratio indicated that magnetoresistance at 3000 Mc. is not more than half as large as for direct currents. (P16, Bi)

399-P. Magnetic Moments and Eddy Currents in Spheres of Superconducting Tin. James J. Fritz, Oscar D. Gonzalez, and Herrick L. Johnston. *Physical Review,* ser. 2, v. 80, Dec. 1, 1950, p. 894-899.

The "frozen-in" magnetic moments produced in superconducting spheres of tin, through demagnetization from fields sufficient to completely or partially destroy their superconductivity, were determined. Both solid tin spheres and spheres filled with non-superconducting material were examined. 14 ref.
(P16, Sn)

400-P. An Empirical Correlation Among Superconductors. J. G. Daunt. *Physical Review,* ser. 2, v. 80, Dec. 1, 1950, p. 911-912.

The correlation is developed on the basis of a tabulated correlation of properties of 9 "soft" superconductors and 2 "hard" superconductors. 21 ref. (P15)

401-P. Note on the Inertia and Damping Constant of Ferromagnetic Domain Boundaries. C. Kittel. *Physical Review,* ser. 2, v. 80, Dec. 1, 1950, p. 918.

Generalizes the Doring equation in order to include the case where intrinsic relaxation frequency of the substance is high. Applies the device introduced by Becker to the Landau-Lifschitz problem, thereby greatly simplifying the calculation and giving insight into the physical mechanism of wall damping; extends the calculation to cubic crystals. (P16)

402-P. Pressure Dependence of Resistance of Germanium. Julius H. Taylor. *Physical Review,* ser. 2, v. 80, Dec. 1, 1950, p. 919-920.

Experimental data are tabulated. An empirical equation representing the pressure dependence of electrical resistance is developed.
(P15, Ge)

403-P. Two Comments on the Limits of Validity of the P. R. Weiss Theory of Ferromagnetism. P. W. Anderson. *Physical Review,* ser. 2, v. 80, Dec. 1, 1950, p. 922-923.

Comments are literally indications of the limits of validity of the theory, and do not detract much from the main achievements of the Weiss method. (P16)

404-P. The Thermodynamics of Substances of Interest in Iron and Steel Making. II. Compounds Between Oxides. F. D. Richardson, J. H. E. Jeffes, and G. Withers. *Journal of the Iron and Steel Institute,* v. 166, Nov. 1950, p. 213-234, 245.

A survey was made of thermal and equilibrium data at present availiable for oxide compounds of interest in iron and steelmaking. Standard free energies of formation of these compounds from their component oxides are calculated up to 2000° C., and results are plotted on free energy vs. temperature diagrams. Equations and sources of data are given for each compound, and limits of accuracy are proposed. Application of these diagrams to slag and similar problems. 134 ref.
(P12, D general, Fe, ST)

405-P. The Thermal Conductivity of Tin, Mercury, Indium, and Tantalum at Liquid Helium Temperatures. J. K. Hulm. *Proceedings of the Royal Society,* ser. A, v. 204, Nov. 22, 1950, p. 98-123.

Method in which differential gas thermometers are used to measure the thermal conductivity of metals at low temperatures, with temperature differences of only 0.02° K. in the specimen. Experimental curves show variation of thermal conductivity with temperature between 1.7 and 4.3° K. for pure Sn, alloys of Sn with Hg, pure Hg, alloys of Hg with Cd and In, pure In, and pure Ta, in both superconducting and normal states. Results are subjected to theoretical analysis. 22 ref.
(P11, Sn, Hg, In, Ta)

406-P. Influence of Thermomagnetic Treatment on Electrical Resistance of Soft Magnetic Materials. (In Russian.) Ya. S. Shur and I. E. Startseva. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 74, Sept. 21, 1950, p. 473-475.

The fact that cooling of certain ferromagnetics from the Curie point to room temperature in the presence of a magnetic field results in a sharp anisotropy of magnetic properties, especially for 66-Permalloy (66% Ni, 34% Fe), was investigated. (P16, SG-n, Ni)

Q

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

844-Q. New Notes on High-Strength Heat Treated Steels. G. Sachs, G. S. Sangdahl, and W. F. Brown, Jr. *Iron Age,* v. 166, Nov. 23, 1950, p. 59-63; Nov. 30, 1950, p. 76-80.

The conventional classification of heat treated, high-strength steels according to hardenability is shown to be incomplete. Notch-bar tensile tests reveal large differences in properties of specimens heat treated to nearly identical hardness, tensile strength, and elongation. Strength and ductility of high-strength steels depend upon their chemistry and structure, as shown by static and impact notch-bar test results. Steels investigated were SAE Nos. 2340, 5140, T-1340, and 1050. 17 ref.
(Q general, J26, CN, AY)

845-Q. On the Endurance Limit of a Round Bar With Longitudinal Grooves. H. Okubo. *Journal of Applied Physics,* v. 21, Nov. 1950, p. 1105-1108.

In a previous paper, it was concluded that the endurance limit of a material should be determined by the amount of the mean stress in a certain area around a point, instead of the stress at the point. The extent of the area was determined for several metals, by using the results of tension-compression fatigue tests. In this paper, extent of area where the mean value of stress is to be taken is determined for a mild steel by a torsion-fatigue test. It is concluded that extent of area chiefly depends on the kind of metal and is independent of experimental methods. (Q7)

846-Q. On the Fredrickson-Eyring Theory of the Mechanical Behavior of Metals. J. Fleeman and G. J. Dienes. *Journal of Applied Physics,* v. 21, Nov. 1950, p. 1193-1194.

Critically analyzes this theory. Indicates that it predicts too much strain hardening and also a relaxation time for deformation recovery which is much too small. Therefore, it fails to account for the permanent deformation in steel in the range − 70 to 100° C. (Q24)

847-Q. Vibration and Fatigue Life of Steel Strand. J. C. Little, D. G. MacMillan, and J. V. Majercak. *Electrical Engineering,* v. 69, Dec. 1950, p. 1065. (Condensed from paper to be published in *AIEE Transactions,* v. 69, 1950.)

Investigation for galvanized carbon, and stainless steel wires. Effects of temperature variation from −55 to 200° F. (Q7, CN, SS)

848-Q. Precision Investment Nonferrous Casting Alloys. *Materials & Methods,* v. 32, Nov. 1950, p. 97, 99.

Tables give nominal compositions, physical and mechanical properties of 9 Cu, 3 Co, 5 Al, and 4 Ni alloys of above type.
(Q general, P general, E15, Cu, Co, Al, Ni)

849-Q. Wire Testing and the Evaluation of Common Tests Applied to Steel Rope Wire. L. R. Steuer. *Wire and Wire Products,* v. 25, Nov. 1950, p. 978-979, 1005.

Nine mechanical test procedures. The three most common types are gage, tensile, and torsion testing.
(Q general, CN)

850-Q. Notch Sensitivity of Various Cast Materials. T. E. Eagan. *American Foundryman,* v. 18, Nov. 1950, p. 22-24.

Results of fatigue tests on both notched and unnotched specimens of AISI 1040 forged steel, cast steel, class 70 acicular gray iron, ductile or nodular cast iron, and class 50 gray iron. Photomicrographs show structures of the five materials.
(Q7, CN, CI)

851-Q. The Physics of the Deformation of Metals. E. N. da C. Andrade. *Endeavour,* v. 9, Oct. 1950, p. 165-177.

A descriptive review and analysis of some recent work. Illustrations include photomicrographs, X-ray patterns, molecular models, and soap-bubble arrays. 16 ref. (Q24)

852-Q. Fatigue Strength of Cable Wire and of the Cable Itself. (In German.) Hermann Donandt. *Archiv für das Eisenhüttenwesen,* v. 21, Sept.-Oct. 1950, p. 283-292.

Surveys literature. Correlates fatigue strengths of load-carrying cables and of their individual wires subjected to tensile and vibrational stresses. Present methods for calculating the strength of wire cables are deceptive since they fail to consider vibrational stresses to which the cables are subjected. 44 ref. (Q7, T7, ST)

853-Q. Yield Point and Aging of Soft Steel. (In German.) Georg Masing. *Archiv für das Eisenhüttenwesen,* v. 21, Sept.-Oct. 1950, p. 315-323; discussion, p. 324-325.

Atomic theory of the deformation of metals, the mutual effect of displacements and metal additions, behavior at blue heat, the mechanical aging of steel, and nature of the yield point of undeformed steel. 21 ref. (Q23, N7, CN)

854-Q. Creep Strength of Pure Aluminum and of the Al-Mg-Si Alloy "Pantal" at 25 and 50° C. (In German.) Karl Wellinger and Ernst Keil. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 92, Oct. 11, 1950, p. 817-820.

Experiments made up to 1000 hr. show that these materials creep at room temperature even below the 0.2 yield point; and that at 50° C. creep strength drops 6-11%. The

cold worked material has a greater tendency to creep than the annealed material. (Q, Al)

855-Q. Some Physical Properties of Eight Refractory Oxides and Carbides. James J. Gangler. *Journal of the American Ceramic Society,* v. 33, Dec. 1, 1950, p. 367-374; discussion, p. 374-375.

Compositions of the ceramics investigated included beryllium oxide, magnesium oxide, stabilized zirconia, zircon, boron carbide, 85% silicon carbide plus 15% boron carbide, titanium carbide, and zirconium carbide. Short-time tensile strengths were determined at 1800 and 2200° F. Resistance to thermal shock was determined by rapid cooling in air from 1800, 2000, 2200, and 2400° F. Thermal-expansion characteristics were studied from room temperature to 1100° F. Hot-pressing of these bodies indicated that a density of at least 93% of theoretical could be obtained.
(Q27, P11, H11, C-n, B, Si, Ti, Zr)

856-Q. Measurement of Low Order Ductility. Norman P. Pinto. *Journal of Metals,* v. 188, Dec. 1950, p. 1444.

Method which involves bending of a bar over a form in which radius of curvature decreases progressively. Radii at each point are predetermined and elongation is read from a graph of radius of curvature at point of fracture vs. known bar thickness. The method has been used successfully for beryllium and tungsten specimens. (Q23, Q5)

857-Q. The Torsion Texture of Copper. W. A. Backofen. *Journal of Metals,* v. 188, Dec. 1950; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, 1950, p. 1454-1459.

Pole figures are presented which describe the texture of OFHC and electrolytic, tough-pitch Cu subjected to various amounts of torsional strain. Development of the torsion texture does not appear to be influenced by the principal normal strain history since all pole figures are symmetrical about directions parallel and perpendicular to the longitudinal axis of the torsion specimens. An explanation of the mode of plastic flow in pure torsion is suggested. 12 ref. (Q1, Q24, Cu)

858-Q. Effect of Ferrite Grain Structure Upon Impact Properties of 0.80 Pct. Carbon Spheroidite. M. Baeyertz, W. F. Craig, Jr., and E. S. Bumps. *Journal of Metals,* v. 188, Dec. 1950; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, 1950, p. 1465-1471.

Object was to investigate further the dependence of ductility upon structure; specifically, it was desired to ascertain whether ferrite grain structure, including both shape and size of the grains, can account for the consistently good performance of tempered martensite in the notched bar impact test. Spheroidite obtained by tempering martensite, with its small, needle-shaped grains, was compared with spheroidite from pearlite. Nickel was chosen as the alloying element to assure martensitic structure throughout upon quenching the impact specimens. Photomicrographs illustrate spheroidite structures as formed and at fracture locations.
(Q6, M27, ST)

859-Q. Alloys of Copper and Iron. Cyril Stanley Smith and Earl W. Palmer. *Journal of Metals,* v. 188, Dec. 1950; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, 1950, p. 1486-1499.

Studies were made of the mechanical and other properties of alloys over the entire composition range from pure Cu to pure Fe. Although the two-phase alloys have poor corrosion resistance unless protected, the composition in the vicinity of 65% Cu possesses an excellent combination of strength and electrical conductivity in the form of cold drawn wire. The alloys near 5-10% Cu have the highest strengths and are the most susceptible to improvement by age hardening. 16 ref.
(Q general, P general, M24, Cu, Fe)

860-Q. Structure of a Deformed Metallic Grain. J. A. Ramsey. *Nature,* v. 166, Nov. 18, 1950, p. 867-868.

Experiments on polycrystalline Zn indicate that upon deformation, the grains break down into a number of fragments. The degree of perfection, and probably the size, of the fragments increase with increasing temperature of deformation.
(Q24, Zn)

861-Q. Breakage of Castings in Transit. J. Dearden. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Oct. 1950, p. 559-561.

Remedies include improved design and packing, also relief of residual stresses. (Q25, CI)

862-Q. The Variation of the Coefficient of Static Friction With the Rate of Application of the Tangential Force. R. C. Parker, W. Farnworth, and R. Milne. *Institution of Mechanical Engineers, Proceedings* (Applied Mechanics Div.), v. 163, W.E.P. No. 59, 1950, p. 176-184; discussion, p. 184.

The coefficient was measured for a number of different materials under impact conditions. An analysis of conditions of impact, derived from collision between solid bodies, and from a suitable hydraulic system, showed the latter to be a more convenient and equally effective method of applying tangential force. Static friction was measured for rates of application of axial force up to 10^3 tons per sec. Under dry conditions, friction increased with rate of applied force, an effect more pronounced between a nonmetal and a metal than between metals. Lubrication with oil diminished variation of friction with rate of application of force for all combinations of materials tested. Data for steel vs. a nonmetallic material and for steel vs. bronze. (Q9, ST, Cu)

863-Q. Gear-Tooth Stresses at High Speed. W. A. Tuplin. *Institution of Mechanical Engineers, Proceedings* (Applied Mechanics Div.), v. 163, W.E.P. No. 59, 1950, p. 162-167; discussion, p. 167-175.

Theoretical, mathematical discussion and analysis. Fatigue data suggest that the number of stress cycles required to cause failure of a given material under any particular stress is independent of the time-rate of repetition of stress. It should therefore be permissible to stress any gear, regardless of its speed, up to the fatigue limit for its material. However, this is not the case. It is believed that errors of pitch and profile in gear teeth may cause actual stresses to be higher than theoretical. High loads may also be induced by operation in a condition approaching that of resonance with some type of vibration. (Q7, Q25, S21)

864-Q. Effect of Type of Bonds on Mechanical Properties of Crystalline Substances. (In German.) Ludwig Graf. *Zeitschrift für Metallkunde,* v. 41, Sept. 1950, p. 286-293.

The behavior of heteropolar, homopolar, and metallic bonds towards lattice translation was investigated. Lattice translation is explained as a composite process of dislocations of atoms, and movement of those dislocations followed by their dissolution. Effects on lattice structures. 29 ref. (Q24, M26)

865-Q. Experimental Determination of Effective Depth of Penetration in Radiographic Stress Determinations. (In German.) Alfred Schaal. *Zeitschrift für Metallkunde,* v. 41, Sept. 1950, p. 293-295.

Cobalt radiation was used to determine above for Fe, Al, and Cu. A formula applicable to all metals is presented.
(Q25, S19, Fe, Al, Cu)

866-Q. Determination From Ludwik Hardness of the Primary Deviation From Hooke's Linear Relationship. (In German.) Rudolf Böklen. *Zeitschrift für Metallkunde,* v. 41, Sept. 1950, p. 295-297.

Shows that the cone test can be used to determine the tensile stress of metals. Experiments with malleable, quasi-isotropic ferrous and nonferrous metals show that this method can be used to determine yield points between 0.01 and 0.02. (Q27)

867-Q. The Problem of Determining the Deforming Properties of Aluminum Alloy Sheets. (In German.) Erich Mohr. *Zeitschrift für Metallkunde,* v. 41, Sept. 1950, p. 303-307.

Deforming properties of Al-Cu-Mg alloys were determined by means of fatigue-bending tests with the sheets under tensile stress in order to correlate chemical composition and cold work hardening with grain size and drawing properties. Special attention is paid to the importance of the sum Mg + Fe + Si on deformability. Shows that determining cold work-hardening curves is an additional method for evaluation of the drawing properties of soft annealed sheets of heterogeneous structure. (Q24, Al)

868-Q. The Temperature Dependence of Fatigue Strength and the Creep-Stress Resistance of Different Light-Metal Sintered and Cast Alloys. (In German.) Karl Wellinger, Ernst Keil, and Gustav Stähli. *Zeitschrift für Metallkunde,* v. 41, Sept. 1950, p. 309-313.

Tests made up to 300° C. showed that the annealed highly alloyed sintered alloys are much more sensitive to temperatures between 20 and 200° C. than the unannealed low-alloy metals. The latter, as well as cast alloys, were found to have satisfactory fatigue strength at elevated temperatures. At 200-250° C., creep-stress resistance was lower than fatigue strength. (Q3, Q7, Al)

869-Q. The Local Strength Properties of Extruded Shapes. I. (In German.) H. Kostron. *Metall,* v. 4, Nov. 1950, p. 451-458.

Extensive microtensile test results on seven typical extruded shapes of the Al-Cu-Mg alloy "Bondur 17/11". Diagrams show locations of test coupons, a large number being obtained from each shape. It was found that the difference in the tensile properties of transverse and longitudinal bars is not quite as great as that calculated theoretically. (Q27, Al)

870-Q. Effect of Structural Inhomogeneities on the High-Temperature Deformability of Magnesium-Aluminum Alloys. (In German.) W. Lott. *Metall,* v. 4, Nov. 1950, p. 458-462.

Shows that the Mn included in Mg-Al alloys to increase corrosion resistance and to refine the melt also has a recrystallization-retarding effect. Mn is less soluble in Mg-Al alloys (6-7% Al) than was formerly assumed. There seems to be no improvement of working properties due to reduced Mn contents in the range of 0.1-0.3%. Nonmetallic, especially oxide, impurities greatly reduce the working properties of this alloy. 11 ref. (Q24, Mg)

871-Q. Relaxation Absorption of Elastic Oscillation in β-Brass Near the

Curie Point. (In Russian.) P. E. Stepanov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 74, Sept. 11, 1950, p. 217-220.

Theoretical, mathematical analysis. (Q21, Cu)

872-Q. Application of Alloy Steels to High-Temperature Steam Turbine Service. W. L. Fleishmann. *Blast Furnace and Steel Plant,* v. 38, Oct. 1950, p. 1183-1186.

Results of creep and rupture tests. Photomicrographs of fractured surfaces. (To be continued.) (Q3, Q4, T25, AY, SG-h)

873-Q. Study of Deformation at High Strain Rates Using High-Speed Motion Pictures. Herbert I. Fusfeld and Josephine Carr Feder. *ASTM Bulletin,* Dec. 1950, p. 75-79; discussion, p. 79.

Previously abstracted from *American Society for Testing Materials,* Preprint 42, 1950. See item 475-Q. (Q27)

874-Q. Plastic Biaxial Stress-Strain Relations for Alcoa 24S-T Subjected to Variable-Stress Ratios. Joseph Marin and B. J. Kotalik. *Journal of Applied Mechanics,* v. 17 *(Transactions of the American Society of Mechanical Engineers,* v. 72), Dec. 1950, p. 372-376.

Stress-strain relations for both constant and variable-stress ratios. Compares actual and theoretically predicted values of biaxial yield, ultimate and fracture strengths, and biaxial ductility. Various ratios of biaxial tensile stresses were investigated by subjecting tubular specimens to axial tension and internal pressure. Results showed that yield-strength values agree best with the distortion-energy theory. (Q27, Al)

875-Q. Three-Dimensional Photoelasticity. A. J. Durelli and R. L. Lake. *Machine Design,* v. 22, Dec. 1950, p. 122-125.

New creeping method which overcomes limitations of conventional freezing technique. Effect of time on photo-elastic fringe patterns under constant load. Shows how creep behavior of plastics is being utilized in a new method for study of stress distribution. (Q25)

876-Q. A Research Into the Relation Between Tensile Tests and the Deep-Drawing Properties of Metals. Claude Arbel. *Sheet Metal Industries,* v. 27, Nov.-Dec. 1950, p. 921-926.

See abstract of original in *Revue de Metallurgie,* item 490-Q, 1950, and condensed version in *Engineers' Digest,* item 716-Q. (Q27, Q23, Cu, Al, SS)

877-Q. The Testing of Metallic Abrasives. R. V. Riley, J. R. Park, and K. Southwick. *Sheet Metal Industries,* v. 27, Nov.-Dec. 1950, p. 955-967.

Applications, essential properties, types and compositions, determination of mechanical properties, microscopic examination, grading, and performance tests. (Q general, L10, S21)

878-Q. Discussion on the Paper—"Mechanical Properties of Low-Carbon, Low-Alloy Steels Containing Boron", by W. E. Bardgett and L. Reeve. *Journal of the Iron and Steel Institute,* v. 166, Nov. 1950, p. 193-199.

Above paper was published in the Nov. 1949 issue. Includes authors' replies. (Q general, AY)

879-Q. Mechanical Twinning in White Tin. R. Clark, G. B. Craig, and B. Chalmers. *Acta Crystallographica,* v. 3, Nov. 1950, p. 479.

Results of experiments conducted to clarify discrepancies among work of other investigators. (Q24, Sn)

R

CORROSION

459-R. Industry Girds for Stronger Corrosion Fight. Bill Czygan. *Iron Age,* v. 166, Nov. 23, 1950, p. 85.

New laboratories and exposure racks recently opened by International Nickel Co. at Kure Beach, N. C. (R11)

460-R. Low Temperature Oxidation of Copper. I. Physical Mechanism. T. N. Rhodin, Jr. *Journal of the American Chemical Society,* v. 72, Nov. 1950, p. 5102-5106.

Validity of Mott's hypothesis was evaluated by a study of the oxidation of the cubic face of single crystals of Cu in the range 78 to 335° K. By use of a sensitive quartz vacuum microbalance, actual surface areas were determined from micro-adsorption isotherms. The growth of very thin oxide films was followed with an accuracy of 2%. The rate equation derived from Mott and Cabrera's hypothesis was found to be valid with some limitations for film thicknesses of 5-50A. and temperatures of 78 to 300° K. 14 ref. (R2, Cu)

461-R. Intercrystalline and Other Types of Corrosion of Steam Boilers. R. E. Coughlan, R. C. Bardwell, R. W. Chorley, B. W. DeGeer, T. W. Hislop, Jr., H. M. Hoffmeister, R. W. Seniff, R. M. Stimmel, and J. E. Tiedt. *American Railway Engineering Association Bulletin,* v. 52, Nov. 1950, p. 223-224.

A brief committee report. (R2, ST)

462-R. Methods and Materials for Protection of Underground Pipe Lines. H. E. Graham, R. C. Bardwell, R. W. Chorley, George Clark, R. E. Coughlan, M. W. Cox, C. E. Fisher, A. K. Frost, F. E. Gunning, A. W. Johnson, J. J. Laudig, G. F. Metzdorf, L. R. Morgan, J. Y. Neat, A. R. Nichols, A. B. Pierce, R. W. Seniff, H. M. Smith, and A. G. Tompkins. *American Railway Engineering Association Bulletin,* v. 52, Nov. 1950, p. 225-229.

A committee report. 13 ref. (R10, Fe)

463-R. Corrosion Behavior of Very Dilute Aqueous Solutions. IV. Corrosion of Copper. (In German.) L. W. Haase. *Werkstoffe und Korrosion,* v. 1, Oct. 1950, p. 390-393.

Theories of corrosion of Cu by dilute solutions (including city water). Warm water reacts with Cu to form hydroxides, carbonates, basic chlorides, and sulfates of Cu, which, however—because of their slight solubility—form mostly a protective coating on the Cu. Traces of Cu in water may deposit on other metals and cause galvanic corrosion. Effects of addition of other elements (As, P, Ag). 11 ref. (R5, R4, Cu)

464-R. Rate of Solution of Copper in Different Salt Solutions and Mechanism of Corrosion of Copper. (In German.) W. Katz. *Werkstoffe und Korrosion,* v. 1, Oct. 1950, p. 393-399.

Long-term experiments were made to determine rates of solution of Cu in NH_4Cl, NaCl, KNO_3, Na_2SO_4, Na_3PO_4, and CH_3COONa solutions, of varying concentration. It was found that Cu may dissolve at accelerated, constant, or retarded rates, depending on solvent and time. Mechanism of corrosion; differential behavior of Cu in different solutions was not explained satisfactorily. (R5, Cu)

465-R. Influence of Pigments on the Effectiveness of Coatings as Corrosion Preventives. (In German.) C. Kalauch. *Werkstoffe und Korrosion,* v. 1, Oct. 1950, p. 400-404.

Comparative experiments made to determine the protective effects of inorganic and organic basic pigments in coatings against oxygen-water corrosion of iron. Tödt's current-time measuring method was used. The mechanism of corrosion of coated metal surfaces explained. 15 ref. (R11, Fe)

466-R. The Effect of Internal Stresses on the Corrosion Process. (In German.) E. Franke. *Werkstoffe und Korrosion,* v. 1, Oct. 1950, p. 404-412.

Reviews literature. The cause and nature of internal stresses; effect of stresses on electrical potential and corrosion rate; effect of surface condition; stress-corrosion in nonferrous metals, iron, and steel; and corrosion fatigue. 201 ref. (R1)

467-R. Formation and Electrochemical Reduction of Oxide Layers on Metals. (In German.) F. Tödt. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie,* v. 54, Oct. 1950, p. 485-494.

Experiments show that the current density of a galvanic cell (Pt cathode and unpolarized anode) is approximately proportional to the quantity of available oxygen. Similar results obtained with Hg and Cu show that the chemical reaction on cathodically polarized electrodes can be quantitatively determined by measuring the current density. 12 ref. (R2, L17)

468-R. Marine Applications of Cathodic Protection and the Electrocoating Process. Herman S. Preiser and Bennett L. Silverstein. *Journal of the American Society of Naval Engineers,* v. 62, Nov. 1950, p. 881-905.

Principles and applications of cathodic protection. Corrosion and fouling of ships. Practical methods for prevention, also for electrolytic derusting and descaling. Some successful applications of cathodic protection to stationary marine structures. Work in progress and that which should be conducted to determine the feasibility of cathodic protection of ships underway. 58 ref. (R10, T22, ST)

469-R. The Mechanism of the Reaction Between Silver and Sulfur in Mineral Oil. R. T. Foley, W. Morrill, and S. J. Winslow. *Journal of Physical & Colloid Chemistry,* v. 54, Dec. 1950, p. 1281-1292.

Purpose of the investigation was to break down the total tarnishing process into its consecutive steps and to evaluate each step, both theoretically and experimentally. Effects of various factors on the sulfiding rate, including effects of a variety of added compounds. 15 ref. (R2, Ag)

470-R. Philosophy of Paint Exposure Testing. C. A. Lominska. *Official Digest,* Oct. 1950, p. 691-720.

Equipment and procedures of National Lead Co. at their Sayville (N. Y.) exposure station. (R11, L26)

471-R. Ship Bottom Corrosion. Paul Field. *Marine Engineering and Shipping Review,* v. 55, Dec. 1950, p. 64-67.

Pitting corrosion due to velocity; pitting corrosion due to stray currents; pitting corrosion due to galvanic currents; telltale characteristics of galvanic corrosion; galvanic corrosion due to the presence of mill scale; and removal of mill scale. (R2, R1, T22, CN)

472-R. Kinetics of Solid Phase Reactions in Oxide Films on Iron; The Reversible Transformation at or Near 570° C. Earl A. Gulbransen and Roswell Ruka. *Journal of Metals,* v. 188, Dec. 1950; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, 1950, p. 1500-1508.

The forward and reverse reactions, $Fe_3O_4 + Fe \rightleftarrows 4FeO$ were studied by electron-diffraction meth-

ods. In thin films, the forward reaction occurs at temperatures 170° C. below the equilibrium value. The mechanism of the forward reaction is shown to be governed by the diffusion of Fe. Studies on the reverse reaction as a function of time, temperature, and oxide composition indicate that nucleation and growth processes are rate controlling. 27 ref. (R2, N1, Fe)

473-R. Performance of Magnesium Anodes Under Actual Service Conditions. T. H. Gilbert. *Gas Age,* v. 106, Nov. 23, 1950, p. 40-41, 67-68.

Current output of Galvo-Pak magnesium anodes is plotted as a function of anode size and soil resistivity. (R10, Mg)

474-R. The Use of Nickel-Containing Alloys in the Pulp and Paper Industry. H. O. Teeple. *Paper Trade Journal,* v. 131, Nov. 9, 1950, p. 28, 30-32; Nov. 16, 1950, p. 19-23; Nov. 23, 1950, p. 14-15, 18-19, 21-25.

Reviews literature on corrosion of Ni alloys in contact with paper-making materials and solutions. Choice of alloys for specific applications. The alloys discussed include not only the Ni-base group, but also the stainless steels and the Ni-alloyed cast irons. 80 ref. (R7, T29, Ni, SS, CI)

475-R. Some Electrical Relations in Galvanic Couples. H. D. Holler. *Journal of Research of the National Bureau of Standards,* v. 45, Nov. 1950, p. 373-380.

Electrical relations are developed for a galvanic couple with and without polarization by externally applied current. Their significance in the derivation of criteria for cathodic protection. The mechanism of current flow between couples at different potentials is explained. The importance of galvanic-couple theory in governing current distribution over an electrode surface. 17 ref. (R1, R10)

476-R. Heat Exchangers at Fulham Power Station. *Light Metals,* v. 13, Sept.-Oct. 1950, p. 515-518.

Charted data show % weight loss vs. hours of operation for steel, untreated Al, and anodized Al. There was essentially no difference between the last two, but the steel lost 60% of its weight during 12,000 hr. of operation and was unfit for further service, as compared with only 11% loss for the Al. (R2, T1, Al)

477-R. Rust Prevention on Ferrous Materials: Steel. G. P. Acock. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Oct. 1950, p. 539-544; discussion, p. 550-554.

Concerned almost entirely with mild steel. Causes of corrosion, and preventive measures which can be taken. (R general, CN)

478-R. Rust Prevention on Ferrous Materials: Cast Iron. W. Westwood. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Oct. 1950, p. 545-550; discussion, p. 550-554.

Corrosion by the atmosphere "industrial" waters, and soils. Corrosion test results of austenitic cast iron, phosphor bronze, and ordinary cast iron in a variety of chemical solutions (mostly aqueous, but a few nonaqueous). Cathodic protection of pipelines. (R general, CI)

479-R. The Anodic Behaviour of Metals. Part VI. Cobalt. S. E. S. El Wakkad and A. Hickling. *Transactions of the Faraday Society,* v. 46, Oct. 1950, p. 820-824.

The initial build-up of anodic polarization at a cobalt anode over a wide range of conditions was investigated using the cathode-ray oscillograph. In alkaline solutions, three stages of oxidation were distinguished corresponding to the formation of CoO, Co_2O_3, and CoO_2. In passivation of a Co anode, the Co_2O_3 forms a protective layer, essentially 1 molecule thick, which is further oxidized to CoO_2 before oxygen evolution commences. 14 ref. (R1, R10, Co)

480-R. Aluminium Vehicle Maintenance. S. J. Nightingale. *Aluminium Development Association,* "Proceedings at a Symposium on Aluminium in Road Transport", 1950, p. 68-77.

Resistance to corrosion, fluctuating stresses, shock, and abrasion. (R general, Q9, Al)

481-R. Isotopic Exchange Between Cobalt and Tantalum and Their Ions in Solution. (In French.) Maurice Cottin. *Comptes Rendus* (France), v. 231, Oct. 9, 1950, p. 697-699.

Co and Ta were studied as important examples of passive metals or metals readily passivated. The surfaces were polished mechanically and electrochemically. Radioactive Co^{60} obtained from Oak Ridge and Ta^{182} from Harwell (England) were used in contact with series of salts of the metals. Conditions favorable or unfavorable to exchange as revealed by the results are summarized. (R10, Co, Ta)

482-R. Aerobic Microbiological Corrosion of Water Pipes. Parts I and II. Erik Olsen and Waclaw Szybalski. *Corrosion* (Technical Section), v. 6, Dec. 1950, p. 405-414.

Reprinted from *Acta Chemica Scandinavica.* See item 67-R, 1950. (R1, Fe)

483-R. Control of Corrosion by Salt Used for De-Icing Highways. John A. Temmerman and Aaron Sterlin. *Corrosion* (Technical Section), v. 6, Dec. 1950, p. 391-393; discussion, p. 393-394.

Cooperative program which resulted in development of a polyphosphate nitrite-base inhibitor. Laboratory tests indicated it was effective in controlling corrosion by salt brines. Weight-loss data on mild-steel panels are given as a function of inhibitor and salt concentrations. Experiences of Rochester, N. Y., using the inhibitor incorporated in rock salt. (R5, ST)

484-R. Studies of Time-Potential Changes on an Electrode Surface During Current Interruption. I. Zinc-Steel Couple in Synthetic Sea Water. Sigmund Schuldiner and Roger E. White. *Journal of the Electrochemical Society,* v. 97, Dec. 1950, p. 433-447.

A d.c. interrupter method developed for oscilloscopic studies of time-potential changes at an electrode surface during short interruption intervals. Studies were conducted using interruption times of 1-20 microsec. An initial study of polarization phenomena on the Zn anode-steel cathode system in a synthetic sea-water electrolyte was carried out using this method. 17 ref. (R11, R4, Zn, ST)

485-R. Effect of Magnetic Transformation at the Curie Temperatures on Oxidation Rates of Chromium-Iron Alloys. Herbert H. Uhlig and Anton De S. Brasunas. *Journal of the Electrochemical Society,* v. 97, Dec. 1950, p. 448-452.

Oxidation rates of Cr-Fe alloys containing 9.2-24% Cr were determined in oxygen above and below the Curie temperatures. Plots of logarithms of oxidation rates vs. reciprocal absolute temperatures show discontinuities at the Curie temperatures. In general, activation energies calculated from the oxidation-rate data are higher above the Curie temperatures than below. The data indicate that rate of formation of thin films is controlled by reaction phenomena at the metal-oxide interface. 18 ref. (R2, P12, P16, Fe)

486-R. Studies on Galvanic Couples. III. Polarization and Cathodic Protection. H. D. Holler. *Journal of the Electrochemical Society,* v. 97, Dec. 1950, p. 453-461.

Mechanism of polarization of a galvanic couple. Roles of electrode potentials and of resistive-potential differences in polarization and cathodic protection. Several methods of showing the relation between polarizing current and galvanic-couple potential. Electrical conditions which determine distribution of current flowing to a galvanic couple. (R1, R10, R11)

487-R. A Unified Mechanism of Passivity and Inhibition. Part II. R. B. Mears and R. H. Brown. *Journal of the Electrochemical Society,* v. 97, Dec. 1950, p. 464-466.

Discussion of above paper by R. B. Mears and R. H. Brown. See item 83-R, 1950. (R10, Al)

488-R. Stabilization of Powdered Copper in Relation to Its Corrosion Resistance. (In Russian.) A. I. Levin and A. V. Pomosov. *Zhurnal Prikladnoi Khimii (Journal of Applied Chemistry),* v. 23, Sept. 1950, p. 949-957.

See abstract of "Hydrophobic Treatment of Metallic Powders for Their Protection Against Corrosion", *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), item 359-R, 1950. (R10, Cu)

S

INSPECTION AND CONTROL

467-S. Thickness Gaging by Radiation Absorption Methods. C. W. Clapp and S. Bernstein. *General Electric Review,* v. 53, Nov. 1950, p. 39-42.

Design techniques applied to gages which measure thickness by radiations of X-rays, beta rays, or gamma rays. (S14)

468-S. Spectrochemical Determination of Iron, Magnesium, and Manganese in Titanium Metal. Maurice J. Peterson. *Analytical Chemistry,* v. 22, Nov. 1950, p. 1398-1400.

An H_2SO_4 solution of the metal is placed in a porous-cup electrode, and excitation is by means of a controlled Multisource unit. Average deviations are approximately ± 8% for Fe and Mn in the ranges 0.08-0.5% and 0.02-0.2%, respectively. Average deviation for Mg is ± 6% in the range 0.05-0.7%. 11 ref. (S11, Fe, Mn, Mg, Ti)

469-S. Iridium in Perchloric, Phosphoric, and Nitric Acid Mixtures; A Spectrophotometric Study. Gilbert H. Ayres and Quentin Quick. *Analytical Chemistry,* v. 22, Nov. 1950, p. 1403-1408.

Development of a spectrophotometric method for determination of Ir. 26 ref. (S11, Ir)

470-S. Polarographic Determination of Cobalt as Trioxalatocobaltate (III). I. M. Kolthoff and James I. Watters. *Analytical Chemistry,* v. 22, Nov. 1950, p. 1422-1426.

New method for determination of Co in the presence of a large excess of Ni, Cu, and Fe, as well as most other elements. 11 ref. (S11, Co)

471-S. Potentiometric, Amperometric, and Polarographic Methods for Microanalysis. Thomas D. Parks and Louis Lykken. *Analytical Chemistry,* v. 22, Nov. 1950, p. 1444-1446.

Various practical methods for the microdetermination of common constituents in petroleum products by the above. Includes methods for Ag, Pb, Fe, and Cu by amperometric

titration; and Pb, Al, and Na by polarographic analysis. 31 ref. (S11)

472-S. Metal Composition Tests for the Steel Melter. H. H. Fairfield, H. F. Graham, and A. E. McMeekin. *Canadian Metals,* v. 13, Nov. 1950, p. 18, 20-21, 40-41.

Previously abstracted from *American Foundrymen's Society,* Preprint No. 50-30, 1950. See item 208-S, 1950. (S11, CN)

473-S. Multiple-Beam Interferometry. S. Tolansky. *Endeavour,* v. 9, Oct. 1950, p. 196-202.

See "Interferometric Study of Metal Surfaces; Application of the Multiple-Beam Technique," *Metal Treatment and Drop Forging,* item 106-S, 1950. (S15)

474-S. Infrared Photography. A Contribution to Industrial Heat-Measuring Techniques. (In German.) Gerhard Naeser and Werner Pepperhoff. *Archiv für das Eisenhüttenwesen,* v. 21, Sept.-Oct. 1950, p. 293-295.

Several photographic methods for measuring temperature. A simple process is based on the fact that certain substances change their colors at specific temperatures. Several examples illustrate the industrial applicability of the process. 14 ref. (S16)

475-S. Nondestructive Materials Testing on Pipe Lines; X-Ray Examination of Welded Pipe Joints. (In German.) Wolfgang Kolb. *Gas-und Wasserfach,* v. 91, Oct. 31, 1950, p. 247-255.

Potentiometric, electromagnetic, and counting-tube methods for measuring the thicknesses of tube walls. The magnetic-powder process for measuring the thicknesses of protective coatings; how specific welded-joint defects can be detected by the X-ray method. 17 ref. (S14, S13)

476-S. Better Ways of Identifying Your Product. Edwin Drewitz. *Product Engineering,* v. 21, Dec. 1950, p. 117-124.

Contemporary methods and processes for better product identification. Among the methods and materials are three-dimensional plastics; decalcomanias; die castings; stamped and etched forms; plastic moldings; integral sand castings, lithographed stampings; embossed sheet metal; multiple-colored metals; quality forgings; porcelain-enameled members; skeleton forms; electroplated stampings; and castings. Types of finishes. (S10, L general)

477-S. Know Your Drill Collar. Trebor B. Morris. *World Oil,* v. 131, Dec. 1950, p. 106-108, 112, 114.

Material and treatment factors which may seriously affect the service performance of drill collars. Relationship between suggested cause and collar performance. Major causes of failure are cracks at joint connections, excessive nonmetallic inclusions in threaded areas; stresses due to nonuniformity of structure; and Brinell hardness outside the optimum range. (S21, T28, AY)

478-S. Surface Casing Failures. B. B. Smith. *World Oil,* v. 131, Dec. 1950, p. 129-130.

Possible causes of failure in surface strings, and preventive measures. (S21, T28, ST)

479-S. X-Ray Examination of Small Parts. *Journal of Metals,* v. 188, Dec. 1950, p. 1443.

Recent experiments of Sam Tour & Co., Inc., indicate that minute parts can be successfully examined by X-ray methods. Example of a very thin stainless steel tube that had fractured in use. (S13)

480-S. Quantitative Spectrographic Analysis of Zirconium-Hafnium Mixtures. Velmer A. Fassel and Charles H. Anderson. *Journal of the Optical Society of America,* v. 40, Nov. 1950, p. 742-747.

Method covering the Hf-Zr concentration-ratio range from 0.001 to 100. Precision determinations showed a standard deviation of 1.5-2.0%. 32 ref. (S11, Zr, Hf)

481-S. Simultaneous Recording of Two Wave-Length Ranges With the Littrow Spectrograph. Robert W. Murphy and Harold K. Hughes. *Journal of the Optical Society of America,* v. 40, Nov. 1950, p. 779-781.

Part of a program designed to reduce the size of samples and to improve the efficiency of spectroscopic analyses. Two wave-length ranges are recorded from a single exposure by use of an auxiliary-mirror system. Elimination of an extra exposure results in substantial reductions in analytical time and in required size of samples. (S11)

482-S. Why Standardize Thicknesses of Thin Flat Metals? I. V. Williams. *Tool & Die Journal,* v. 16, Dec. 1950, p. 58, 60, 69.

Arguments in favor of standardization. (S22)

483-S. Automatic Sorting Speeds Piston and Wristpin Production. *Steel,* v. 127, Dec. 11, 1950, p. 91-92.

Refrigerator compressor parts are gaged electronically by a fast classifier that eliminates manual methods entirely. This device has reduced rejects 35% at Westinghouse's East Springfield, Mass., plant. (S14, T7)

484-S. Here's How Quality Control Pays Off in the Aircraft Industry. Gilbert C. Close. *Industry & Welding,* v. 23, Nov. 1950, p. 36-38, 40-42; Dec. 1950, p. 30-31, 70-71.

Application to various examples of welded construction. (S12, Kg)

485-S. Cobalt-60 Used for Weld Inspection. W. L. Schwinn. *Welding Engineer,* v. 35, Dec. 1950, p. 24-28. Condensed from paper published in "Symposium on the Role of Non-Destructive Testing in the Economics of Production", American Society for Testing Materials, Philadelphia.

Results of extensive study made by Babcock & Wilcox Co. to determine comparative costs and results of X-radiography, radium radiography, and Co-60 radiography for inspection of steel weldments. The latter is much cheaper than radium. While more expensive than X-radiography, use of Co-60 provides more satisfactory results for certain types of work. (S13)

486-S. A New Technique for Inspecting Metals. Gilbert C. Close. *Finish,* v. 7, Dec. 1950, p. 19-21, 48.

Dye-penetrant technique developed by Turbodyne Corp. It can be used on the production line or in the field. (S13)

487-S. Instrumentation and Automatic Control in the Steel Industry. A. Linford. *Machinery Lloyd* (Overseas Edition), v. 22, Nov. 11, 1950, p. 68-71, 73, 75, 77. (S16, ST)

488-S. Testing the Metal or Testing the Casting. Some Notes on the New Swedish Grey-Iron Specification. Erik O. Lissell. *Foundry Trade Journal,* v. 89, Nov. 9, 1950, p. 357-364; Nov. 16, 1950, p. 391-397.

Previously abstracted from *Institute of British Foundrymen,* Paper No. 976, 1950. See item 568-Q. (S22, Q general, CI)

489-S. Metallurgical Applications of Ultra-Violet Light. A. G. Deeming. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Oct. 1950, p. 533-537; discussion, p. 537-538.

Applications to analysis, testing, and inspection of metals. 15 ref. (S general)

490-S. Measurement of Thickness of Nonmagnetic Coatings. (In Russian.) L. F. Kulikovskii and A. M. Melik-Shakhnazarov. *Elektrichestvo* (Electricity), Aug. 1950, p. 67-70.

Apparatus for direct measurement of thickness of nonmagnetic coatings on magnetic bases. Includes theoretical explanation of the mechanism of the device. (S14)

491-S. Detection of Soil Removal in Metal Cleaning by the Radioactive Tracer Technique. J. C. Harris, R. E. Kamp, and W. H. Yanko. *Journal of the Electrochemical Society,* v. 97, Dec. 1950, p. 430-432.

Tracer technique was used to define apparent limits of sensitivity of the water-break, fluorescent-dye, and copper-plate methods of soil detection. Quantitative estimates of limits of sensitivity are given. (S15, S19, L12)

492-S. An X-Ray Method for Determining Tin Coating Thickness on Steel. *Journal of the Electrochemical Society,* v. 97, Dec. 1950, p. 472-474.

Discussion of above paper by H. F. Beeghly. See item 153-S, 1950. (S14, L17, Sn, ST)

493-S. Improved Radioactive-Tracer Carrier for Metal Cleaning Studies. J. C. Harris, R. E. Kamp, and W. H. Yanko. *ASTM Bulletin,* Dec. 1950, p. 82-83.

Previously abstracted under similar title from *Journal of the Electrochemical Society.* See item 491-S. (S15, S19, L12)

494-S. A Blueprint for Quality Control of Raw Materials. Harry D. Greenwood. *Western Metals,* v. 8, Nov. 1950, p. 19-20.

First of a series. Quality control of raw materials up to the point of inclusion in the manufactured product. (S12)

495-S. Why Machine Parts Fail. (Concluded.) **Part 8. When Not to Blame the Designer.** Charles Lipson. *Machine Design,* v. 22, Dec. 1950, p. 151-156.

Failures caused by defective metallurgy, improper methods of fabrication and assembly, and other factors usually beyond direct control of the designer. 10 ref. (S21, ST)

496-S. (Book) **Quality Control and Statistical Methods.** Edward M. Schrock. 213 pages. 1950. Reinhold Publishing Corp., 330 W. 42nd St., New York 18, N. Y. $5.00.

Presents in elementary form many of the widely successful procedures developed and tested over the past 25 years by statistical quality control engineers Although it is a good summary of successful experience in quality control, the book is by no means even an introduction to statistical reasoning, or to the logic behind the procedures recommended. The chapters on significance tests and on least squares are marred by errors of fact and judgment. (From review in *Chemical and Engineering News.*) (S12)

T

APPLICATIONS OF METALS IN EQUIPMENT

496-T. Aluminum Conductors for Aircraft. W. W. Schumacher. *Electrical Engineering,* v. 69, Dec. 1950, p. 1064. (Condensed from paper to be published in *AIEE Transactions,* v. 69, 1950.)

Substantial weight savings can be achieved by substitution of Al for Cu. Development of optimum terminal design which has minimized previous difficulties caused by increasing terminal resistance with age, due to oxidation. (T1, T24, Al)

497-T. USAF Tests Titanium in Airplane Structurals. *Steel,* v. 127, Nov. 27, 1950, p. 60-61.

Current Air Force research which may result in wide use of titanium alloys in the airframe structure of supersonic aircraft and missiles. The work is being done in cooperation with Battelle Memorial Institute and other Air Force contractors.
(T24, Ti)

498-T. Materials of Construction. 43 authors. *Chemical Engineering,* v. 57, Nov. 1950, p. 107-154.

14th annual report is divided into 13 major sections, each dealing with materials of construction for a common corrosive chemical; subsections on the major types of materials of construction. Numerous chemical-process flowsheets, indicating recommended materials of construction for each of the units or parts of units. Concludes with 12-page directory of materials, giving trade name or common designation, manufacturer, composition, and most important applications.
(T29, R general)

499-T. Packaging Notebook. VII. Metal Drums. *Chemical Engineering,* v. 57, Nov. 1950, p. 239-240, 242, 244.

Fabrication drums for transportation and storage of miscellaneous liquid chemicals. ICC specifications. Research program of Steel Shipping Container Institute at Battelle Memorial Institute on linings for the drums. (T26, T29, CN)

500-T. Construction Materials in the Paper Industry. Part II. Bleaching. *Chemical Engineering,* v. 57, Nov. 1950, p. 255-256, 258-259, 261-264.

"Chlorimet", Walter A. Luce; "Durimet 20", Walter A. Luce; "Tantalum", Leonard R. Scribner; "Iron and Steel", Arthur E. May and Albert W. Spitz; "Worthite", W. E. Pratt; "Coatings", Kenneth Tator; "Lead", Kempton H. Roll; and "Rubber", James P. McNamee.
(T29, R5, Ni, Cr, Ta, Fe, ST, Pb)

501-T. Lighter Freight Cars From Aluminum. Hugh G. Jarman. *Canadian Metals,* v. 13, Nov. 1950, p. 10, 12, 49.

Advantages. Structural details, flooring and siding, and fabrication. (T23, Al)

502-T. Metals for Gas Turbines. Norman L. Mochel. *Journal of the American Society of Naval Engineers,* v. 62, Nov. 1950, p. 920-929.

Reprinted from *American Society of Mechanical Engineers,* Paper No. 49-A-85, Dec. 1949. See item 245-T, 1950. (T25, SG-h)

503-T. Close Tolerance Die Castings Cut Auto Transmission Cost. *Steel,* v. 127, Dec. 4, 1950, p. 96-97.

A variety of precision Al die castings used in the above.
(T21, E13, Al)

504-T. Extruded Bronze Speeds Jet Bomber Production. *Steel,* v. 127, Dec. 4, 1950, p. 100.

Use of extruded bronze counterweights to eliminate flutter in tail sections of the Boeing B-47B Stratojet. Substitution for steel eliminates undesirable magnetic effects. Saving in machining time more than offsets increased initial cost. (T24, Cu)

505-T. Metallurgy in Petroleum Refining. Donald A. Craig. *Mines Magazine,* v. 40, Oct. 1950, p. 80-85, 96.

Various aspects, including corrosion, welding, high-temperature metals, testing and inspection, etc. (T29)

506-T. "It Checks". *Industry & Welding,* v. 23, Dec. 1950, p. 43, 45.

Light-weight magnesium chassis-frame checking fixture with close tolerances fabricated by Magline, Inc. It greatly reduces the weight-handling factor for a large automobile manufacturer. (T5, Mg)

507-T. Designing To Meet Sanitary Needs. Frank Mittelberger. *Product Engineering,* v. 21, Dec. 1950, p. 144-149.

Design of equipment for processing of foods, pharmaceuticals, and other products where a high degree of freedom from contamination is required. Material selection and surface conditions. Construction of valves, fittings, pumps, kettles, heat exchangers, etc. (T29)

508-T. Bearing Metals—Nickel-Alloyed Brass and Bronze. James S. Vanick. *Foundry,* v. 78, Dec. 1950, p. 80-83, 211-212.

Compositions of bronzes for various types of bearing applications. Third of a series on nickel-alloyed brass and bronze. Tables give compositions and pertinent mechanical properties. (T7, Q general, Cu)

509-T. Cast Iron Gas Mains Today; Technical Observations. W. Boden. *Gas,* no. 2, Sept. 29, 1950 (Supplement to *Gas Journal*), p. 5-10.

Casting methods, standardization, design, protective coatings, testing, installation procedures, causes of failure, and gas-flow formulas applicable to pipe lines.
(T4, E general, L general, S21, CI)

510-T. Form + Finish = Gift Sales. *Die Castings,* v. 8, Dec. 1950, p. 19-21.

A few of the more interesting gift and premium items which use one or more Zn die-cast parts. (T10, Zn)

511-T. Longer Life for Cutting Wire Due to Die Cast Mounting. *Die Castings,* v. 8, Dec. 1950, p. 24-27.

Die-cast Al frames for miscellaneous food cutters and slicers.
(T10, Al)

512-T. Die Cast Piston Replaces 2-Piece Screw Machine Part. *Die Castings,* v. 8, Dec. 1950, p. 29.

Al-alloy die casting is used for "reverse servo pistons" for Buick Dynaflow transmissions. Advantages. (T21, Al)

513-T. Uninterrupted Operation of Process Machine Depends on Die Cast Parts. *Die Castings,* v. 8, Dec. 1950, p. 32-35.

Bottle-unpacking machine used in breweries and soft-drink plants, also some of its die-cast Al parts.
(T29, Al)

514-T. How To Improve Product Function. *Die Castings,* v. 8, Dec. 1950, p. 22, 61-63.

Die-cast Al-alloy housing for hair clipper. (T10, Al)

515-T. Aluminum Deck for the Huey Long Bridge. *Railway Engineering and Maintenance,* v. 46, Dec. 1950, p. 1121-1124. Huey Long Bridge Gets Aluminum Deck. *Railway Age,* v. 129, Dec. 9, 1950, p. 36-39.

Procedures used in replacement of the original galvanized sheet-steel deck with aluminum. (T26, Al)

516-T. Cast-Iron Floor Plates for Car-Wheel Shops. L. B. Curtiss. *Railway Engineering and Maintenance,* v. 46, Dec. 1950, p. 1131.
(T26, CI)

517-T. Paint Grinding Balls Made of Improved Alloy Cast Iron. Kenneth A. DeLonge. *Paint and Varnish Production,* v. 30, Sept. 1950, p. 17, 22.

Advantages of use of "Ni-Hard"—a martensitic white iron containing 4.0-4.75% Ni. (T29, CI)

518-T. Sintered Carbides—New Tool of Ceramics. John W. Graham and W. L. Kennicott. *Ceramic Industry,* v. 55, Dec. 1950, p. 93-94, 96.

Properties and applications of carbides as applied to various tools for processing of ceramic ware.
(T6, C-n)

519-T. ELC Stainless for Pulp Mill Duct System. George T. Dexter. *Welding Engineer,* v. 35, Dec. 1950, p. 30-33.

Use of Type 316 ELC (extra-low carbon) stainless steel. Includes description of arc welding procedure.
(T28, K1, SS)

520-T. Rolled Alloys Hold Important Place in Field of Fabricated Heat Resistant Equipment. Paul Goetcheus. *Industrial Heating,* v. 17, Oct. 1950, p. 1762-1764, 1766, 1768, 1770, 1772.

Illustrates a wide variety of components made from rolled mill forms of heat resisting alloys. Compositions suitable for temperatures above and below 1600° F. Use of high-temperature expanded metal for trays, baskets, etc. used to hold parts during heat treatment.
(T5, SG-h)

521-T. At British Lion Studios, Shepperton. *Light Metals,* v. 13, Sept.-Oct. 1950, p. 494-496.

Use of aluminum bus-bars in motion-picture studio. (T1, Al)

522-T. Aluminium in Commercial Vehicles. E. L. Oglethorpe. *Aluminium Development Association,* "Proceedings at a Symposium on Aluminium in Road Transport", 1950, p. 15-27.

Use for truck bodies. Developments during the past 29 years.
(T21, Al)

523-T. Aluminium in Public Service Vehicles. A. J. Romer. *Aluminium Development Association,* "Proceedings at a Symposium on Aluminium in Road Transport", 1950, p. 28-39.

Use for engine, frame, and body parts. (T21, Al)

524-T. Aluminium in the Private Car. E. S. White. *Aluminium Development Association,* "Proceedings at a Symposium on Aluminium in Road Transport", 1950, p. 40-45.

Engineering and tooling aspects concerned with body design.
(T21, Al)

525-T. Aluminium From the Users' Angle. G. Geoffrey Smith. *Aluminium Development Association,* "Proceedings at a Symposium on Aluminium in Road Transport", 1950, p. 78-86.

Advantages of the use of aluminum in automobile construction.
(T21, Al)

526-T. The Behavior of Light-Metal Sheets Used on Hot-Plate Presses. (In German.) Hermann A. J. Stelljes. *Zeitschrift für Metallkunde,* v. 41, Sept. 1950, p. 307-309.

The phenomenon of shrinkage of Al sheets used for pressing plywood. Possible remedies. (T29, P11, Al)

527-T. An Aluminum Alloy in Car Construction. E. C. Hartmann, G. B. Hauser, and R. L. Moore. *Railway Mechanical and Electrical Engineer,* v. 124, Dec. 1950, p. 717-721.

Superior mechanical and corrosion resistant properties of 61S-T6, and its use for freight and passenger-car construction.
(T23, Q general, R general, Al)

528-T. Two New Gear Materials. *Machinery* (American), v. 57, Dec. 1950, p. 179-182. Condensed from paper by C. M. Schwitter.

Properties, annealing, manufacturing procedures, and applications of Nitralloy N—an alloy steel which is simply a rather heavily alloyed version of the SAE 4300 type, with no unusual features except the presence of about 1.25% Al. (Ductile iron will be dealt with in the second article.)
(T7, J23, Q general, AY)

529-T. Pump Parts Last Longer With Silicon Carbide. J. J. Burns. *Engineering and Mining Journal,* v. 151, Dec. 1950, p. 94-95.

SiC pump parts used by St. Joseph Lead Co., to circulate abrasive Zn-ore suspensions. Comparative wear data. (T7, Q9, C-n, Si)

530-T. Expansion in the Use of Aluminium. E. G. West. *Metallurgia,* v. 42, Nov. 1950, p. 320-325.

Surveys new applications developed since 1929. (T general, Al)

531-T. (Book) **Proceedings at a Symposium on Aluminium in Road Transport.** 100 pages. 1950. Aluminium Development Association, 33 Grosvenor St., London, W.1, England.

Six papers on the use of aluminum in motor vehicles, its proper-

ties and fabrication, and aluminum vehicle maintenance. Papers are abstracted separately. (T21, Al)

532-T. (Book) **Schraubenherstellung** (The Production of Screws). 244 pages. Stahleisen, Dusseldorf, Germany.

The production of bolts and nuts, and the history of making these fasteners. Stresses, and testing of raw material and finished bolts. Manufacturing processes, subdivided into production and composition of steel, warm heading and cold heading, minor processes, threading by chip-removal and plastic deformation, heat treating, and production of nuts. Apparatus and machinery; Standards for materials and finished bolts; patents; and an extensive bibliography. (T7)

533-T. (Book) **Metallische Werkstoffe der Elektro-Technik.** (Metallic Materials in Electrical Technology). A. Schulze. 403 pages. 1950. Metall-Verlag, G.m.b.H., Berlin, W.15, Germany. 24 DM.

Subject is presented in three sections: Electrical conductor materials, metallic resistance materials, and metallic materials for thermocouples. Sections 2 and 3, which make up the bulk of the book, have been published previously but have been enlarged and brought up-to-date for inclusion in the present work. Each section deals with properties and applications of the various metals and alloys suitable for inclusion in the section. 378 ref. (T1, T8, P15, SG-a, q, r)

V

MATERIALS
General Coverage of Specific Materials

229-V. **Titanium Data.** *Aviation Week,* v. 53, Nov. 20, 1950, p. 38-39.

Results of work on mechanical and fabrication properties done for the U. S. Air Force's Air Materiel Command by Battelle Memorial Institute; and on the Kroll method for production of Ti by U. S. Bureau of Mines. (Ti)

230-V. **The Titanium Program at the U. S. Naval Experiment Station.** W. Lee Williams. *Journal of the American Society of Naval Engineers,* v. 62, Nov. 1950, p. 855-869.

Types of titanium; fatigue properties; marine-corrosion properties; cavitation resistance. 15 ref. (Q7, R2, Ti)

231-V. **High Alloy Weldments for Heat and Corrosion-Resistant Applications.** Paul Goetcheus. *Industrial Heating,* v. 17, Nov. 1950, p. 1928, 1930, 1932, 2052-2053.

Second of series on heat and corrosion resistant materials. Deals with AISI Types 309, 310, 330, and related stainless steel compositions. Design recommendations for welding these alloys. (K general, SG-g, h)

232-V. **How To Work Tool and Die Steels.** *American Machinist,* v. 94, Dec. 11, 1950, p. 147-162.

Classified list of 800 tool and die steels based on SAE and JIC methods with names of suppliers, compositions, typical properties, applications, and basic heat treatment data. (TS)

233-V. **Nodular Cast Iron—Literature Report No. 10.** B. S. Srikantiah and B. R. Nijhawan. *Journal of Scientific & Industrial Research,* v. 9, Oct. 1950, p. 364-366.

Surveys 8 recent publications (1947-49). (CI)

234-V. **Zirconium.** G. L. Miller. *Industrial Chemist and Chemical Manufacturer,* v. 26, Oct. 1950, p. 435-441.

Early methods of preparing Zr, commercial production, and properties and applications of the metal. (Zr)

235-V. **Properties and Usage of Copper and Its Alloys.** W. H. Dennis. *Mine & Quarry Engineering,* v. 16, Dec. 1950, p. 381-385. (Cu)

236-V. **Properties and Fabrication of Aluminium.** E. G. West. *Aluminium Development Association,* "Proceedings at a Symposium on Aluminium in Road Transport", 1950, p. 46-67.

Alloy types, properties, working characteristics, joining, and surface finishing. 26 ref. (Al)

237-V. **Twenty-One Years of Progress in Special Steels.** D. A. Oliver and J. S. Bristow. *Metallurgia,* v. 42, Nov. 1950, p. 279-282.

A review. (ST, AY)

238-V. **Carbon and Low Alloy Steels.** I. M. Mackenzie. *Metallurgia,* v. 42, Nov. 1950, p. 282-284.

Review developments during the past 21 years. (CN, AY)

239-V. **A Review of the Developments in the Metallurgy of Cast Iron.** J. E. Hurst. *Metallurgia,* v. 42, Nov. 1950, p. 289-292.

Reviews developments of past 20 years. (CI)

240-V. **Changes in the Non-Ferrous Metals Industry.** William H. Henman. *Metallurgia,* v. 42, Nov. 1950, p. 297-299.

Reviews developments of past 21 years. (EG-a)

241-V. **Copper During** *Metallurgia's* **Lifetime.** E. Voce. *Metallurgia,* v. 42, Nov. 1950, p. 299-302.

Reviews progress since 1929 (date of first publication of *Metallurgia.*) (Cu)

242-V. **Nickel and Nickel Alloys; A Review of Progress Since 1929.** *Metallurgia,* v. 42, Nov. 1950, p. 302-307. (Ni)

243-V. **Tin and Its Alloys.** John Ireland. *Metallurgia,* v. 42, Nov. 1950, p. 307-310.

Reviews developments of past 21 years. (Sn)

244-V. **Progress in the Precious Metals.** J. C. Chaston. *Metallurgia,* v. 42, Nov. 1950, p. 310-313.

Reviews progress of past 21 years in Au, Ag, Pt and the 5 other "platinum metals". (Au, Ag, Pt, EG-c)

245-V. **21 Years of Progress in the Zinc Industry.** *Metallurgia,* v. 42, Nov. 1950, p. 313-316, 352-353.

A review. (Zn)

246-V. **The Aluminium Industry, 1929-1950.** W. C. Devereux. *Metallurgia,* v. 42, Nov. 1950, p. 317-320.

A review. (Al)

247-V. **Magnesium and Magnesium Alloys, 1929-1950.** F. A. Fox. *Metallurgia,* v. 42, Nov. 1950, p. 325-328, 333.

Surveys progress. (Mg)

248-V. (Pamphlet) **Bibliography—Nodular Iron.** C. C. Reynolds and B. F. Brown. 1950, 13 pages. *Massachusetts Institute of Technology,* Cambridge, Mass.

Covers 1949-50. Includes scattered references back to 1929. 206 ref. (CI)

249-V. (Book) **Selection and Hardening of Tool Steels.** L. H. Seabright. McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. $5.00.

Designed to aid in more accurate and scientific selection of the right toolsteel for a given job, this manual gives a classification of steels according to uses and chemical compositions, and shows the relationship of properties of one steel to another. Classifies toolsteels into 12 main groups, according to type of job to be performed and physical properties desired. The 12 groups are further broken down into 46 sub-groups according to chemical composition. Chemical analyses of 950 toolsteels are listed. (T6, J26, TS)

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

East

RESEARCH AND GRADUATE ASSISTANTSHIPS: Available Feb. 1, 1951. Research in both physical and chemical metallurgy. Research assistants permitted one-third student schedule; graduate assistants two-thirds student schedule toward advanced degree. Large eastern university. Box 1-5.

METALLURGIST: With knowledge of foundry practice to teach foundry, metallurgy and allied subjects in a state technical institute in western New York. Position now open. Furnish details of age, education, experience, salary required; include photograph. Box 1-10.

RESEARCH FELLOWSHIP: Available July 1, 1951. Stipend $1800 to $2400 depending on marital status. Research on arc welding to be conducted in metallurgy department of well-known Eastern university. Candidate for Ph.D. may carry full schedule toward degree. Applications must be received before April 1, 1951. Box 1-15.

SALESMAN: Nationally known steel distributor has opening in western New York State for salesman 25 to 35 with some metallurgical experience or training. Sales or mill experience desirable. Give qualifications, education, and experience, and enclose photo. Box 1-20.

Midwest

METALLURGICAL ENGINEER: For research work on product development; should have sound background in fundamentals of ferrous metallurgy and must be able to carry out research project work with a minimum of supervision. Should be familiar with heat treatment, stress analysis and design problems. Box 1-25.

METALLURGIST: Experienced in heat treating fundamentals and interested in sales and development work. Box 1-30.

METALLURGIST-CHEMIST: With experience in heat treating and metallography of ferrous and nonferrous material. Process control pertaining to aircraft industries. Box 1-35.

METALLURGICAL ENGINEER: For supervisory position in aircraft industry. Requirements; M.S. or higher in metallurgy from recognized school. Experience in radiography, welding, heat treatment of ferrous and light metals, fusion and spot welding. Also considerable metallography. Immediate opening. Write or wire qualifications to Employment Supervisor, Boeing Airplane Co., Wichita Div., Wichita, Kansas.

PHYSICIST or PHYSICAL METALLURGIST: With Ph.D. or equivalent. Excellent opening for applicant with good background in solid state physics and X-ray diffraction. Will be responsible for portion of research program in measurement of residual stresses. Address: Personnel Dept., International Harvester, Mfg. Research, 5225 South Western Blvd., Chicago 9, Ill.

RESEARCH METALLURGIST: Excellent opening for metallurgist with interest and knowledge of modern research methods. Prefer man with advanced college training but not essential. Should be able to initiate and execute over-all research program. Excellent opportunities for advancement in growing organization. Write: Metals Dept., Armour Research Foundation, Chicago 16, Ill.

West

METALLURGICAL ENGINEER: For leading manufacturer of industrial valves. Must have thorough knowledge of and be experienced in all phases of ferrous metallurgy, including metallography, X-ray, plating and foundry. Age 30 to 38; college graduate. Excellent opportunity for qualified applicant of exceptional ability and personality. Plant is complete manufacturing division of long-established national company located in the San Francisco Bay area. Please furnish details of age, education, experience, expected salary and photograph. All replies confidential. Box 1-40.

METALLURGIST: Nationally known company has opening for man of high caliber to handle research and development work on light alloy castings. Well-rounded knowledge of practical problems related to the production of quality castings is a basic requirement. Educational qualifications and perspective must be of a high order. Box 1-45.

Government Positions

INTELLIGENCE SPECIALIST—AIRCRAFT MATERIALS: To conduct air technical intelligence research relating to foreign research and development in metallurgy of such materials as aluminum, magnesium, titanium, high-temperature alloys and ceramics as used in aircraft, guided missiles and related components. Write Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio. Attention: Intelligence Dept. (MCIZ)

PHOTO INTELLIGENCE SPECIALIST: Metallurgists with photo interpretation experience to work in Pentagon. Civil Service grade and salary depend on education and experience in metallurgy but range from $4600 to $6400. For further information write: Photo Intelligence Section, Reconnaissance Branch, Directorate of Intelligence, Headquarters, United States Air Force, Washington 25, D. C.

CHEMIST: For metallurgy division of Naval Reseach Laboratory. M. S. degree or equivalent with major emphasis on inorganic chemistry is desired. Position calls for synthesis of high-purity inorganic compositions for luminescent and piezol electrical composition. Write: Personnel Division, Code 1817, Naval Research Laboratory, Washington 25, D. C. Job number GS-7, (1).

NUCLEAR PHYSICIST: Nucleonics division of Naval Research Laboratory. Good knowledge of modern nuclear physics and electronics is necessary. M.S. degree or equivalent required. Write: Personnel Division, Code 1817, Naval Research Laboratory, Washington 25, D. C. Job number GS-9, (45).

POSITIONS WANTED

METALLURGICAL ENGINEER: B.S. from Rensselaer Polytechnic Institute. Presently employed as construction engineer but desires position in metallurgical field. Prefers any phase of welding or heat treating, but will consider others. Single, 26 years old, and no geographic preference. Box 1-50.

METALLURGICAL CHEMIST: Long experience in all phases of nonferrous smelting, refining, casting. Has full laboratory facilities and some time for analyses and consultation. Prompt attention, reasonable fees, highest recommendations. Box 1-55.

CHEMICAL AND METALLURGICAL ENGINEER: Age 33, married. B.S., University of Notre Dame, 1940. Ten years experience in heat treatment and quality control in automotive plant, head of laboratories in magnesium and gray iron foundry, and in research and development work in powdered metal plant. Desires metallurgical position in foundry or metalworking plant. Box 1-60.

METALLURGICAL - MECHANICAL ENGINEER: Age 32, married, two children. Five and one half years of college; ten years of good experience in mechanical testing, metallography, production and development work with metallurgical and research division of large corporation. Desires permanent position in Chicago area. Box 1-65.

METALLURGIST: Sc.D. in metallurgical engineering and physical metallurgy. 22 years of diversified experience in hot and cold working, extruding, heat treating, surface treating, trouble shooting, process quality control and all phases of testing of ferrous and nonferrous alloys. Supervision of research and development work resulting in improved fabricating and testing methods. Presently employed, but desires more responsible work in the above fields of experience. Box 1-70.

PRACTICAL METALLURGIST: Eight years in large metal fabricating plant. Specialization in manufacturing problems dealing with wide variety of ferrous and aluminum alloys. Knowledge of substitute materials. Considerable experience in supervision and research. Capable of setting up laboratory. Graduate work under fellowship. Age 33, married. Box 1-75.

GRADUATE METALLURGIST: Thirteen years industrial plant and laboratory experience in both ferrous and nonferrous metallurgy, including fabrication, powder metallurgy, refractory metals, and corrosion resistant alloys. Thoroughly experienced in metallurgical problems encountered in the electronics and lamp industries. Presently engaged in research and development. Midwest preferred. Box 1-80.

METALLURGICAL ENGINEER: Met. Eng. degree, age 36. Fourteen years diversified experience in ferrous foundry research and development, heat treating, trouble shooting, stress analysis, and radiography. Interested in development of nodular iron. Capable of directing metallurgical control and research program. Box 1-85.

METALLURGICAL ENGINEER: Fifteen years successful diversified experience: production, research, development, customer contact and liaison in carbon, alloy, stainless steels; automotive production; process equipment; ordnance equipment; teaching; consultant, including arc and gas welding. Proven administrative ability in junior executive capacities. Presently employed staff assignment. Desires position with greater future possibilities. Master's degree, professional engineer. Age 36, married. Box 1-90.

METALLURGIST: Desires post in administration, production or sales. Recent extensive sales experience. Considerable service in ferrous foundry and forge shop operations. Knowledge of small arms ammunition manufacture. Familiar with the preparation of reports, abstracts, specifications and technical correspondence. Now located in the East but no geographical preference. Box 1-95.

DEVELOPMENT ENGINEER: Three years experience. Metallurgical Engineering graduate. Age 24, draft exempt. Experienced in chemical and physical testing, statistics, openhearth smoke research and development, experimental steel testing, report writing, and development and quality control in openhearth, forge and rolling mills. Prefers development work in or near Pittsburgh vicinity. Good reference. Box 1-100.